Outer Limits/Fawn Two Timber Management Project

Environmental Assessment and Finding of No Significant Impact
Environmental Assessment (EA) Number: DOI-BLM-ORWA-S040-2014-0004-EA
Project Name in National NEPA Register: Outer Limits/Fawn Two Timber Sale

April, 2016

United States Department of the Interior
Bureau of Land Management, Oregon State Office
Salem District, Cascades Resource Area
Marion and Linn Counties, Oregon
T. 8 S., R. 3 E., Section 25;
T. 10 S., R. 4 E., Sections 17 and 29, W.M.

Responsible Agency:	USDI-Bureau of Land Management
Responsible Official:	John Hustion, Field Manager Cascades Resource Area 1717 Fabry Road SE Salem, OR 97306
For Further Information, contact:	Alisa Tanner Cascades Resource Are 1717 Fabry Road SE Salem, OR 97306 (503) 589-6844

BLM
Salem District

As the Nation's principal conservation agency, the Department of Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering economic use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

BLM/OR/WA/AE-16/007+1632

FINDING OF NO SIGNIFICANT IMPACT

Introduction

The Bureau of Land Management (BLM) Salem District Office, Cascades Resource Area (RA) has conducted an environmental analysis for a proposal to commercial thin approximately 289 acres of 76-101 year old forest stands and regeneration harvest 79 acres of 93 and 134 year old forest stands. An additional alternative proposes to thin the 368 acres of 76-134 year old forest stands. Both alternatives include clearing 3 acres for road construction. The project is located on BLM-administered lands in T. 10 S., R. 4 E., Section 17 and 29; T. 8 S., R. 3 E., Section 25; W.M. in Marion and Linn Counties, Oregon. The Outer Limits/Fawn Two Environmental Assessment (EA) (#DOI-BLM-OR-S040-2014-0005-EA) documents the environmental analysis of the proposed timber management alternatives. The EA is attached to and incorporated by reference in this Finding of No Significant Impact (FONSI) determination. The EA and unsigned FONSI will be made available for public review and comment from April 1st, 2016 to April 30th, 2016 (*EA Section 5.3*).

The analysis in this EA is site-specific and supplements analyses found in the *Salem District Proposed Resource Management Plan/Final Environmental Impact Statement*, September 1994 (RMP/FEIS). The proposed timber management activities have been designed to conform to the *Salem District Record of Decision and Resource Management Plan*, May 1995 (RMP) and related documents which direct and provide the legal framework for management of BLM lands within the Salem District (*EA Section 1.3*).

Finding of No Significant Impact

The FONSI is defined in 40 CFR 1508.13 as a document briefly presenting the reasons why an action will not have a significant effect on the human environment which includes the natural and physical environment and the relationship of people with that environment.

If the agency "finds" that the action has "no significant impact", the agency is not required to prepare an Environmental Impact Statement (EIS) for the project. 40 CFR 1508.27 defines the factors to consider in determining whether a project is anticipated to "significantly" impact the human environment. The following FONSI documents the BLM's evaluation of the potential impacts of the Outer Limits/Fawn Two Project.

Based upon review of the Outer Limits/Fawn Two EA and supporting documents, the proposed project is not a major federal action and would not significantly affect the quality of the human environment, individually or cumulatively with other actions in the general area. No environmental effects described in the EA meet the definition of significance in context or intensity as defined in 40 CFR 1508.27. Therefore, supplemental or additional information to the analysis in the RMP/FEIS in the form of an EIS is not needed. This finding is based on the following discussion:

Context **[40 CFR 1508.27(a)]** refers to the suitable scale for analysis. Potential effects resulting from the implementation of the proposed project have been analyzed within the context of the project area boundaries, and the following 6th field watersheds: Rock Creek, Madd Creek, and the Little North Fork Santiam – Elkhorn Creek. The 368 acre project would affect less than 1 percent of the combined 43,755 acres in these three 6th field watersheds.

Intensity **[40 CFR 1508.27(b)]** refers to severity of impact. The following ten sections refer to the specific conditions/concerns addressed in §1508.27 and document the BLM's consideration of the severity of the impacts as assessed in the Outer Limits/Fawn Two EA.

Impacts that may be both beneficial and adverse [40 CFR 1508.27(b) (1)]: The effects of commercial thinning and regeneration harvest are unlikely to have significant (beneficial and/or adverse) impacts *(EA Chapter 3)* for the following reasons:

Project Design (EA Section 2.3): The proposed treatments described in EA Section 2.3.1 (Proposed Action, including the project design features (PDF) described in Table 7) and EA Section 2.3.2 (Alternative Action) were developed by the Interdisciplinary Team (IDT) of BLM Resource Specialists so that the risk of effects to affected resources would conform to RMP Management Direction and be within the effects described in the RMP/FEIS.

Vegetation and Forest Stand Characteristics (EA Section 3.3.1): Effects to these resources would not have significant impacts because:

A forest environment would be maintained in the project area by retaining green trees within project units (*EA Table 15*).

A component of legacy green trees would be maintained in the regeneration harvest units under the Proposed Action consisting of 15-22 green trees per acre, selected from larger than average trees emphasizing retaining trees larger than 36 inches diameter.

For thinning areas within the Proposed and Alternative Actions there would be no identifiable adverse impacts to suitable habitat for Special Status species in the project units or any known or undiscovered Special Status species populations from this project because the nature of the thinning would not change these habitats in a way that would preclude those species. Potential undiscovered populations include seasonal fungi species.

The project would not contribute to the need to list any BLM Special Status species.

BLM examined past timber harvest areas near the proposed project areas and found no evidence to indicate that adverse impacts from invasive/non-native species would occur as a result of the proposed project.

Hydrology, Fisheries and Aquatic Habitat (EA Sections 3.3.2; 3.3.3): Effects to these resources would not have significant impacts since the project effects on water quality would comply with Oregon Department of Environmental Quality (ODEQ) water quality standards because:

In general, there would be no direct alteration of the physical features of project area stream channels or wetlands from timber harvest or logging operations, with the exception of culvert replacements on the haul routes.

The Proposed Action is unlikely to affect stream flow and potential increases in stream flow from the Alternative Action are unlikely to exceed the threshold for peak flow augmentation, so the project is unlikely to cause indirect effects to stream channels as a result of flow alteration or timing.

The project would maintain current stream temperatures by retaining the current vegetation and shading in the primary shade zone (stream protection zones, or SPZ) and most of the current levels of shading provided by the secondary shade zone.

It is unlikely that the Proposed Action or the Alternative Action would result in a discernible effect to the levels of turbidity or water clarity in project watersheds or that turbidity levels would reach levels that would impact aquatic organisms or cause additional treatment expense or technical difficulties for the downstream water providers. Water quality would be maintained because logging, road construction/renovation, culvert replacement, road maintenance and timber haul PDFs (*EA Table 7*) and SPZ are expected to prevent sediment from reaching streams and causing sediment/turbidity that would exceed ODEQ water quality standards.

Water quality would also be maintained because road construction would occur on gentle, stable slopes, thereby minimizing the possibility of mass movement and/or sediment delivery through surface runoff to streams. Runoff from new roads would drain to stable, vegetated slopes where it would infiltrate into the soil rather than connect to stream channels to transport sediment or augment peak flows.

No changes in project area hydrology due to project actions are likely to be detectable, including mean annual water yield, fog drip, base flow and peak flows.

The project would not impact stream channels, aquatic habitat or fish populations because it would not cause water quality impacts that exceed ODEQ water quality standards and would not detectably change project area hydrology.

Soils (EA Section 3.3.4): Effects to this resource would not have significant impacts because:

The PDFs (*EA Table 7*) limit machinery operations so that there would be an overall maximum increase of 12 percent of the project area in moderate to heavy compaction/disturbance of soils from all sources, which is within RMP standards (C-2, 10 percent from logging; and C-9, 2 percent from site preparation) analyzed in the RMP/FEIS.

In the Proposed and Alternative Actions no loss of growth and yield would be expected at the stand level because thinning treatments typically lead to acceleration of average tree growth and compacted soils affect less than half of the rooting area of individual trees.

In the Proposed Action no measurable loss in timber stand productivity is expected over the next rotational (full cycle of stand establishment to regeneration harvest and establishment of the next stand, approximately one century) due to soil compaction and disturbance from logging operations in regeneration harvest units because of the limited scope of compaction (see above) and the long-term response of trees planted in compacted soils in this area.

Following completion of thinning (all 368 acres in the Alternative Action, or 289 out of 368 acres in Proposed Action), the majority of organic matter, understory vegetation and root systems would remain.

Following completion of regeneration harvest (79 acres in the Proposed Action) the majority of root systems would remain to provide soil stability. Vegetation would provide ground cover within 1-3 years as vegetation resprouts and conifer trees are planted and established.

The project would not lead to any measurable increase in surface erosion and overall erosion would remain within the natural range of background erosion rates.

The project would maintain sufficient mycorrhizae populations because the root systems of most vegetation would remain undisturbed.

Wildlife (EA Section 3.3.5): Effects to this resource would not have significant impacts because:

Proposed treatments (and non-treatment) would have trade-offs of effects in both the short and long term which would be beneficial to some species and detrimental to other species. The variation within proposed treatments and maintaining untreated forest stands adjacent to all treated stands would provide a range of habitat conditions to balance the trade-offs of effects.

Stands proposed for thinning or regeneration harvest are not presently functioning as late-successional or old growth habitat and no remnant legacy trees older than 200 years would be affected.

Existing snags and coarse woody debris (CWD) would be retained on site. Snags that need to be felled for safety would be left on site as CWD.

Proposed treatments would not significantly change species richness (a combination of species diversity and abundance) of the Migratory and Resident Bird community. No species would be extirpated from the local area as a result of thinning. No take of species is anticipated from thinning or regeneration harvest due to seasonal restructions during nesting season.

See Intensity Point # 9 (*Below, 40 CFR 1508.27(b) (9)*) for effects to northern spotted owl.

Air Quality and Fire Hazard/Risk (EA Section 3.3.6): Effects to this resource would not have significant impacts because:

After 3 to 5 years the fine fuels generated by thinning or regeneration harvest would be decayed in the units and the risk of surface fire would decrease to near current levels. Under the Proposed Action and Alternative Action, fuels treatment for site preparation would immediately reduce the risk of surface fire to equalt or less than current levels.

The project would comply with State of Oregon Air Quality Standards by strict adherence to smoke management regulations.

Carbon Storage, Carbon Emissions and Climate Change (EA Section 3.3.7): Effects to this resource would not have significant impacts because:

The short-term carbon emissions and difference in long-term carbon storage that could be attributable to the Proposed Action or Alternative Action are of such small magnitude that it is unlikely to be detectable at global, continental or regional scales. Additonally, changes in carbon stores are unlikely to affect the results of any models now being used to predict climate change.

Recreation, Visual Resources, and Rural Interface (EA Section 3.3.8): Effects to this resource would not have significant impacts because:

Recreation visitation would be moderately restricted for short periods (weeks) in specific locations (units) during a 3–5 year period for safety, then should return to prior usage.

There are no authorized recreation trails to be impacted. No long term changes (more than weeks within a 3-5 year period) to public access would result from the project.

Changes to the landscape character would comply with Visual Resource Management (VRM) class 3 and 4 objectives. PDFs, time in view and unit locations mitigate any adverse effect to scenic resources according to VRM class 3 and 4 objectives (*EA Section 3.3.8.2*). Proposed

timber harvest operations would not increase Off Highway Vehicle (OHV) access to units as most skid trails and all new roads would be blocked after operations are complete.

[40 CFR 1508.27(b) (2)] - The degree to which the proposed action affects public health or safety (*EA Sections 1.6, 1.7.1, 2.3, 2.3.1, 3.3.6, 3.3.7, 3.3.9, Table 7,*)*:* The project would not adversely affect public health or safety because:

Public access to much of the proposed project areas is restricted by private gates. Public access to hazardous work areas where there are accessible roads would be restricted by either flatters, warning signs and temporary traffic control barriers or devices.

Occupational Safety and Health Administration (OSHA) mandated health and safety regulations are applied to all project operations related to the project implementation.

All actions of the project must meet national and State of Oregon DEQ air and water quality standards, as provided for by the RMP/FEIS.

[40 CFR 1508.27(b) (3)] - Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas: Effects to these resources would not have significant impacts because:

The project would not affect historical or cultural resources because there are no known cultural resources within project units or other locations where they could potentially be impacted by project operations. On site cultural and historic surveys have been completed and have not produced evidence to support the previous or present existence of artifacts of significant cultural or historical value (*EA Section 3.3.9).*

There are no park lands, prime farmlands or wild and scenic rivers within the project units to be impacted.

[40 CFR 1508.27(b) (4)] - The degree to which the effects on the quality of the human environment are likely to be highly controversial: The project is not unique or unusual. The BLM has experience implementing actions similar to both the Proposed Action and the Alternative Action in similar areas so the effects are well known and not highly controversial.

[40 CFR 1508.27(b) (5)] - The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks: The effects of the project do not have any uncertain, unique or unknown risks because the BLM has experience implementing similar actions in similar areas without these risks. No potential unique or unknown risks were identified by the BLM or by comments submitted in response to internal and external scoping. PDFs would minimize the risks associated with the project (*EA Sections 2.1, 2.2, 2.3.1, 2.3.2*). See Intensity Point # 4 (*40 CFR 1508.27(b) (4)*), above.

[40 CFR 1508.27(b) (6)] - The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration: The project would not establish a precedent for future actions beyond the time frames analyzed nor would they represent a decision in principle about a further consideration for the following reasons:

The project is in the scope of proposed activities documented in the RMP/FEIS.

The BLM has experience implementing similar actions in similar areas without setting a precedent for future actions or representing a decision about a further consideration. See Intensity Point #s 4 (*40 CFR 1508.27(b) (4)*) and 5 (*40 CFR 1508.27(b) (5)*), above.

[40 CFR 1508.27(b) (7)] - Whether the action is related to other actions with individually insignificant but cumulatively significant impacts: The IDT evaluated the project areas in context of past, present and reasonably foreseeable actions and determined that there is a potential for cumulative effects on water quality and fisheries, peak flows and fisheries, and carbon storage and emissions. These effects are not expected to be significant for the following reasons:

Water Quality/Fisheries: The proposed project would be expected to temporarily increase stream sediment and turbidity as a result of culvert replacement, road maintenance, and road use (*EA Sections 3.3.2, 3.3.3*). These effects are not expected to be significant for the following reasons:

Any sediment increase resulting from thinning would be too small to be discernable relative to background sediment yields, would not be expected to exceed ODEQ water quality standards and would decrease quickly over time, returning to current levels within three to five years as vegetation increases (*Dissmeyer 2000*).

The limited magnitude of sediment inputs (non-detectable on 7th field watershed scale, not visible more than 800 meters downstream of crossings) and duration (primarily major storm events during the first year following disturbance at culvert replacement sites) of this effect would likely be insignificant for water quality on the watershed scale. Cumulatively, the Proposed Action and Alternative Action would be unlikely to result in any detectable change for water quality on a 7th field watershed scale (even less effect on the larger 6th field watershed scale) and would be unlikely to have any effect on any designated beneficial uses, including fisheries (*EA Section 3.3.2.2, 3.3.3.2*).

Road use restrictions, road design and maintenance, protection measures and monitoring of road conditions would prevent increases in turbidity that exceed ODEQ standards which were established to maintain water quality (*EA Section 2.3.1., and Table 7*). When water quality is maintained within ODEQ standards, changes to sediment levels would not significantly impact fisheries, including listed fish habitat (LFH) (*EA Sections 3.3.2.2, 3.3.3.2*).

Peak Flows and Fisheries: Neither the Proposed Action nor the Alternative Action, combined with the effects of BLM's estimate of potential harvest on private lands over the next 10 years, would augment peak flows to exceed the threshold for peak flow effects. (*EA Sections 3.3.2.1, 3.3.2.2, 3.3.3.1, 3.3.3.2*)

The project carries no risk for contributing to any existing cumulative effect to watershed hydrology because the watersheds are currently at a low risk for impacts and there would not be any detectable direct or indirect effects to surface flows or ground water. (*EA Sections 3.3.2.1, 3.3.2.2*)

The project is at low risk for potential increases in peak flows so it would not affect stream channels, large wood or sediment levels in project areas streams and therefore would not significantly affect fisheries. (*EA Sections 3.3.2.2, 3.3.3.2*)

Carbon storage and carbon emissions (*EA Section 3.3.7*): Proposed and Alternative Action would contribute to cumulative effects to carbon storage and carbon emissions. The effects are not significant for the following reasons:

The short-term increase in carbon emissions and difference in long-term storage that could be attributable to the proposed project are of such small magnitude, as determined by analysis, that it is unlikely to be detectable at global, continental or regional scales or to affect the results of any models now being used to predict climate change.

Late successional habitat: The Outer Limits/Fawn Two Proposed Action proposes to perform regeneration harvest on 79 acres of late successional forests on the BLM lands (*EA Section 3.3.5.2*). After harvest, the watershed would remain above the late successional habitat guideline of 15 percent on Federal lands (*EA Section 3.3.5.2*).

[40 CFR 1508.27(b) (8)] - The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources: The project would not affect these resources because no districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places exist within or near the proposed project vicinity. (*EA Section 3.3.9)*

[40 CFR 1508.27(b) (9)] - The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act (ESA) of 1973: The project is not expected to adversely affect ESA listed species or critical habitat for the following reasons:

ESA Wildlife - Northern spotted owl *(EA Section 3.3.5):* Effects to the species are not significant because:

The Proposed Action modifies but maintains 289 acres of dispersal and suitable habitat in the affected watersheds. Habitat conditions are expected to improve as thinned stands mature (>20 years) in treated stands; and retained trees would increase in size and be available for recruitment or creation of snags, culls and CWD for prey species and nesting opportunties, particularly in Riparian Reserves. Seasonal restrictions on project activities within on quarter mile of centers of activity would prevent disturbance during nesting season.

The Proposed and Alternative action implements management direction provided in the RMP and is within the effects analyzed in the RMP/FEIS. The Proposed Action removes 63 acres of suitable habitat in the Fawn Two area outside of known owls sites and 16 acres of dispersal habitat in the Outer Limits area within the PHR of a known owl site. The Alternative Action downgrades 63 acres of suitable habitat to dispersal habitat in the Fawn Two area. In the Alternative Action, the remaining 305 acres of dispersal and suitable habitat in the project area would be modified by thinning, but remain dispersal and suitable habitat.

Existing snags and coarse woody debris (CWD) would be retained on site as much as feasible. All snags felled or knocked over for safe and efficient logging operations would be retained as CWD.

Stands proposed for thinning and regeneration harvest are not presently functioning as old growth habitat and no remnant legacy trees older than 200 years would be cut or removed.

Thinning of dispersal habitat in Sections 17 and 29 and suitable habitat in Section 17 is a "not likely to adversely affect" action for spotted owls as described in the Biological Assessment (BA) and the Biological Opinion (BO) (*EA Section 5.1.1*). Spotted owl suitable habitat will be maintained by keeping at least 60 percent canopy cover after thinning. Dispersal habitat will be maintained by keeping at least 40 percent canopy closure. Regeneration harvest of 16 acres of dispersal habitat in Section 17 is also a "not likely to adversely affect" action for spotted owls (*EA Section 3.3.5.2*).

Forest stands in units 25A and 25B are suitable habitat for spotted owls. Removal or downgrade of spotted owl suitable habitat in the BA and BO is termed a "Likely to Adversely Affect" action. These stands are suitable spotted owl habitat based on age of the stand, canopy cover, diameter of the trees, and decadence in the stand, amount of snags and amount of woody debris on the ground. Past surveys have not indicated presence of spotted owls inside the Fawn Two area units. Units 25A and 25B are currently outside the PHR (1.2 mile radius) for any known owl site (*EA Section 3.3.5.2).*

The Fawn Two area Proposed and Alternative actions are in compliance with the new Final Recovery Plan for the Northern Spotted Owl (*USFWS 2011*). The habitat is not located in LSR or critical habitat, and does not meet the criteria for Recovery Action 10 or Recovery Action 32. No Incidental Take of spotted owls is expected to occur as a result of the Proposed or Alternative Actions. Current surveys show no spotted owl presence in the Fawn Two area. There are no actual spotted owls that would be "harmed" by the action and thus the BO (*pp.133-134*) did not issue any "take" of spotted owls associated with this project.

The proposed thinning, regeneration harvest, and connected actions described in this EA have incorporated the applicable General Standards that were described in the BA (*pp. 9-10*) and BO (*BO, pp. 22-24*); and comply with all reasonable and prudent measures outlined in the BO (*BO, pp. 134-135).* This includes delaying proposed activities to avoid disrupting spotted owls at known spotted owl sites until after the critical nesting season, and monitoring/reporting on the implementation of this project to the USFWS.

The Proposed Action or Alternative Action is not likely to affect spotted owl Critical Habitat, and not likely to diminish the effectiveness of the conservation program established under the Northwest Forest Plan (NWFP) to protect the spotted owl and its habitat.

ESA Consultation is described in EA Section 5.1.

ESA Fish – Upper Willamette River (UWR) Chinook salmon, UWR steelhead trout *(EA Section 3.3.3):* Effects to ESA fish are not significant because thinning or regeneration harvest is not expected to affect these species for the reasons stated in the Hydrology section (*EA Section 3.3.2*).

Effects of road maintenance and log hauling are not significant because PDFs would prevent sediment from entering streams in quantities sufficient to exceed ODEQ water quality standards. The haul routes are designed and maintained to support year around use and direct most water and sediment onto stable slopes where it infiltrates rather than delivering it to streams. Condition related restrictions and monitoring would prevent generating and delivering sediment to streams.

New road construction would be located in stable locations and would not contribute to degradation of aquatic habitat or extend the stream network through ditches on new roads draining into streams.

ESA Consultation is described in EA Section 5.1.

[40 CFR 1508.27(b) (10)] - Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment: The proposed thinning and regeneration harvest activities have been designed to follow Federal, State, and local laws (*EA Section 1.7*)

John Huston, Cascades Resource Area Field Manager – Unsigned, for Review and Comment

Chapter 1: Introduction

This environmental assessment (EA) analyzes the impacts of a proposed regeneration harvest and thinning project and connected actions on the human environment. The EA provides the decision-maker, the Cascades Resource Area Field Manager, with current information to aid in the decision-making process. Chapter 1 of this EA provides a context for what will be analyzed in the EA, describes the kind of actions being considered, defines the project area, describes what the proposed and alternative actions needs to accomplish, identifies the criteria that will be used for choosing the alternative that will best meet the purpose and need for the proposed project, and describes the statutes and other authorities which govern the proposed project.

1.1 Action Alternatives[1] [2]

1.1.1 Proposed Action - Thinning and Regeneration Harvest

The Cascades Resource Area, Salem District Bureau of Land Management (BLM), proposes to thin approximately 289 acres of 76-101 year old forest stands[3]. The Proposed Action also includes regeneration harvest of approximately 79 acres of 93 and 134 year old forest stands, leaving between 15-22 trees per acre. Connected actions include: habitat improvement such as one low density thinning area approximately 3 acres in size, road maintenance, renovation, culvert replacement and/or improvement; road decommissioning, stabilization and closure; and fuels treatment. The proposed action includes clearing approximately 3 acres for new road construction.

1.1.2 Alternative Action - Thinning

The Cascades Resource Area, Salem District BLM, proposes to thin approximately 368 acres of 76-134 year old[4] forest stands. Connected actions include: habitat improvement such as one low density thinning approximately 3 acres in size, road maintenance, renovation, culvert replacement and/or improvement; road decommissioning, stabilization and closure; and fuels treatment. Alternative Action includes clearing approximately 3 for new road construction.

[1] Thinning is a generic term used for cutting a portion of the trees in a forest stand to manage tree densities to achieve defined objectives. Density management, or commercial thinning (RMP D-4) accomplishes this by selling designated standing trees to a purchaser who cuts those trees, removes the logs and performs connected actions (*see EA Chapter 2*) under the terms of a BLM contract. Terms that may be used interchangeably in this EA and supporting documents in the project file include; proportional thinning, thinning, and treatment as well as other verb tenses of thin and treat. Acres for thinning include acres considered for "low density thinning areas".

[2] Regeneration harvest is a term used for removing a majority of the merchantable timber in an area, reserving and retaining the level of green, live trees, standing dead and downed woody debris as described in the Salem District RMP to achieve defined objectives for Matrix lands (*RMP pg. 48*), including reforestation, and continued stand maintenance.

[3] A "forest stand" is a contiguous group of trees which is similar enough and growing on a site that is uniform enough to be identifiable. "Forest stand" - or simply "stand" – is used in this document as a generic term that does not indicate management objectives. "Timber stand" – or simply "timber" – is used for forest stands where commercial wood production is an objective. Other terms such as "habitat" are used to provide context for other objectives.

[4] Total stand ages calculated as of July, 2014.

1.2 Project Area[5] Location and Vicinity

The proposed projects are located within Marion and Linn County, Oregon.

For reference, this project is often described as two areas for this analysis:

Outer Limits: Township 10 South, Range 4 East, Sections 17and 29 Willamette Meridian, within the Middle North Santiam 5th field watershed, Linn County.

Fawn Two: Township 8 South, Range 3 East, Section 25 Willamette Meridian, within the Little North Santiam 5th field watershed, Marion County.

Both projects are on BLM-administered lands. The Fawn Two project units are also within the Upper Little North Santiam River 6th field watershed, and the Outer Limits project units are within the Rock Creek and Mad Creek 6th field watersheds. BLM lands are intermixed with privately-owned industrial timberland, United States Forest Service (USFS) and State of Oregon timberland, creating a mosaic of ownership patterns (*see Figures 1-6).*

[5] "Project area" is the area proposed for treatment such as thinning or other operations such as road construction and road renovation. "Project vicinity" is the contiguous block(s) of BLM managed lands within the **sections** that contain the project area. The "Vicinity Map" shows the project vicinity and additional area.

Maps

Figure 1: Vicinity Map for Outer Limits and Fawn Two areas

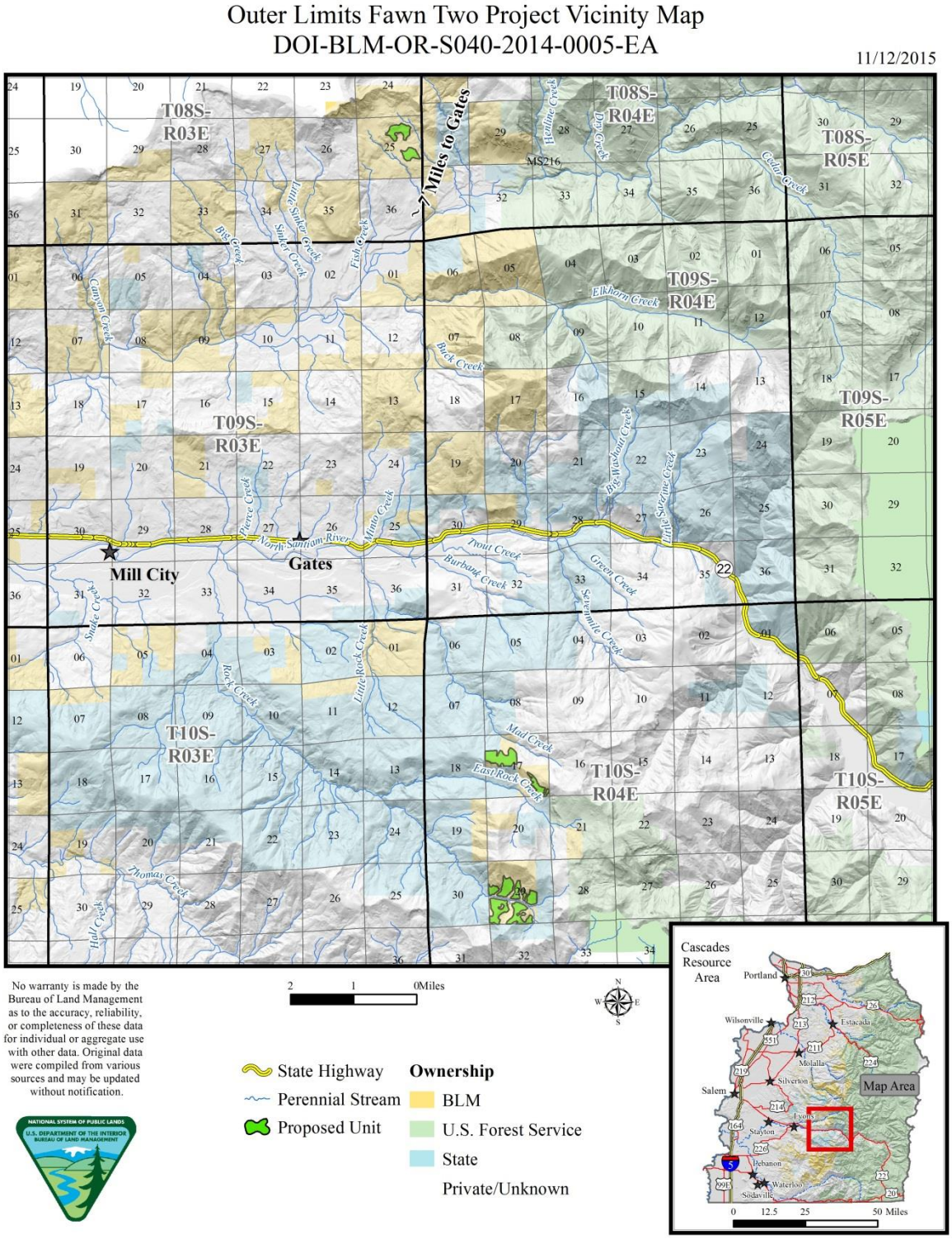


Figure 2: Vicinity Map for the Outer Limits area

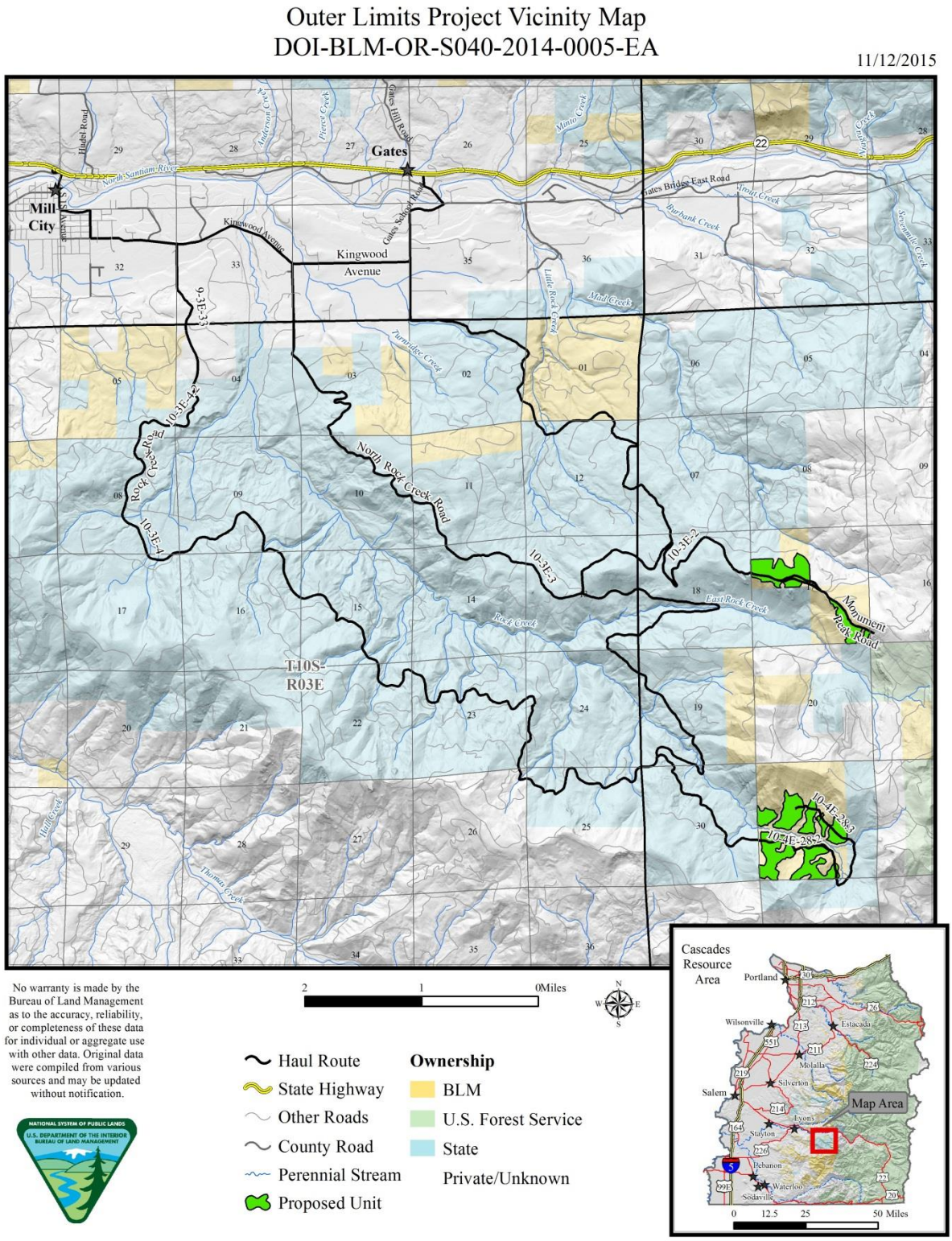


Figure 3: Vicinity Map for the Fawn Two area

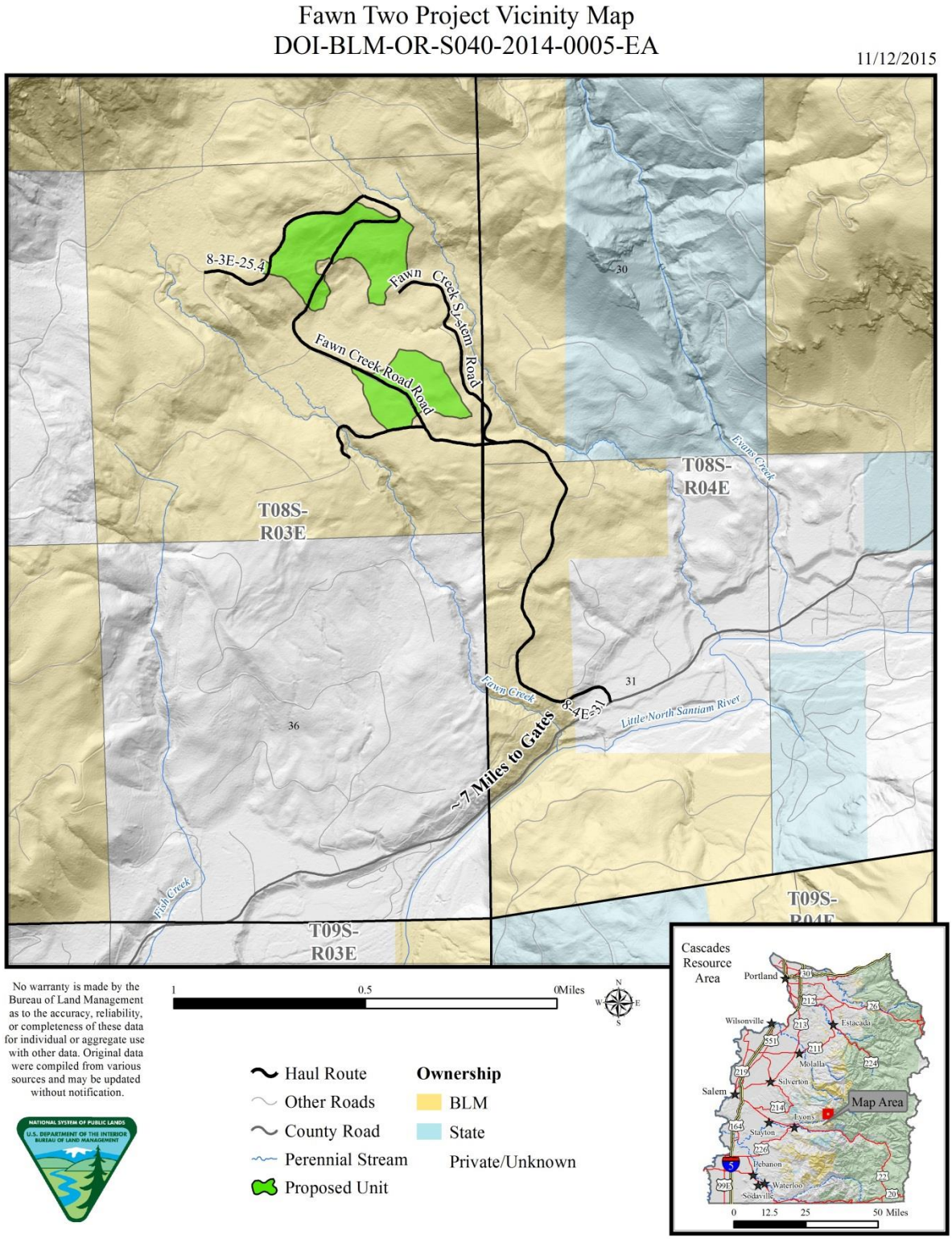


Figure 4: Outer Limits area Section 17

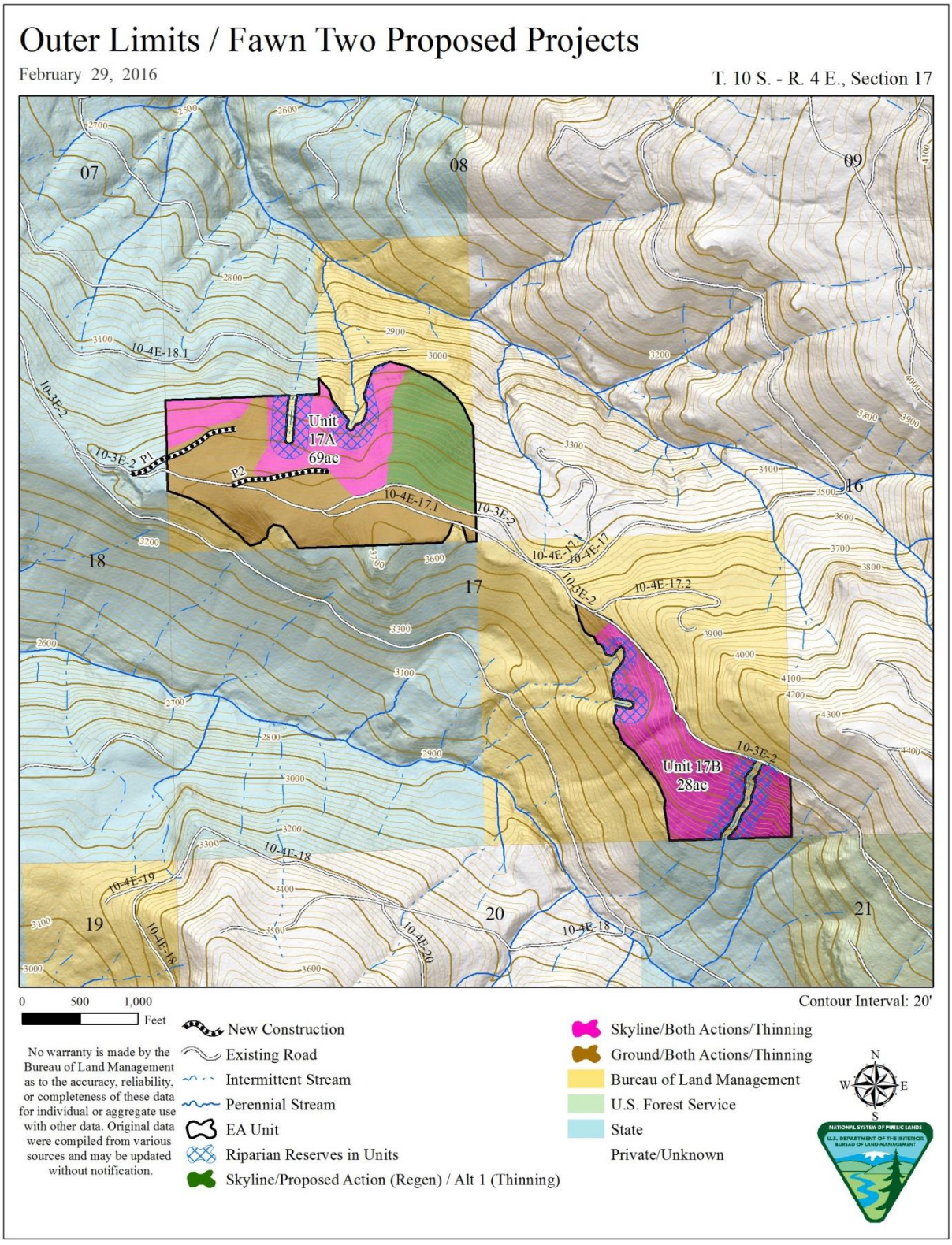


Figure 5: Outer Limits area Section 29

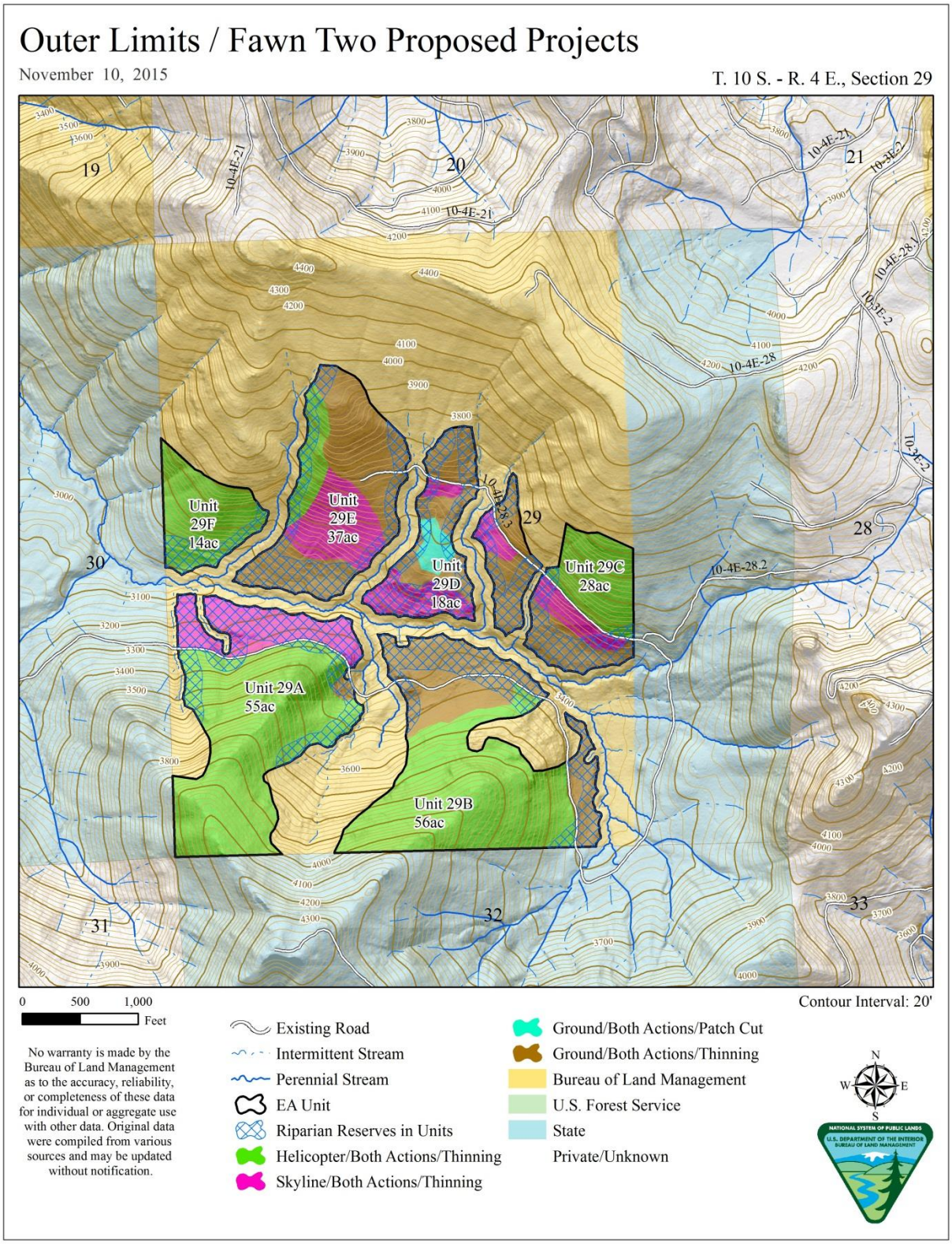
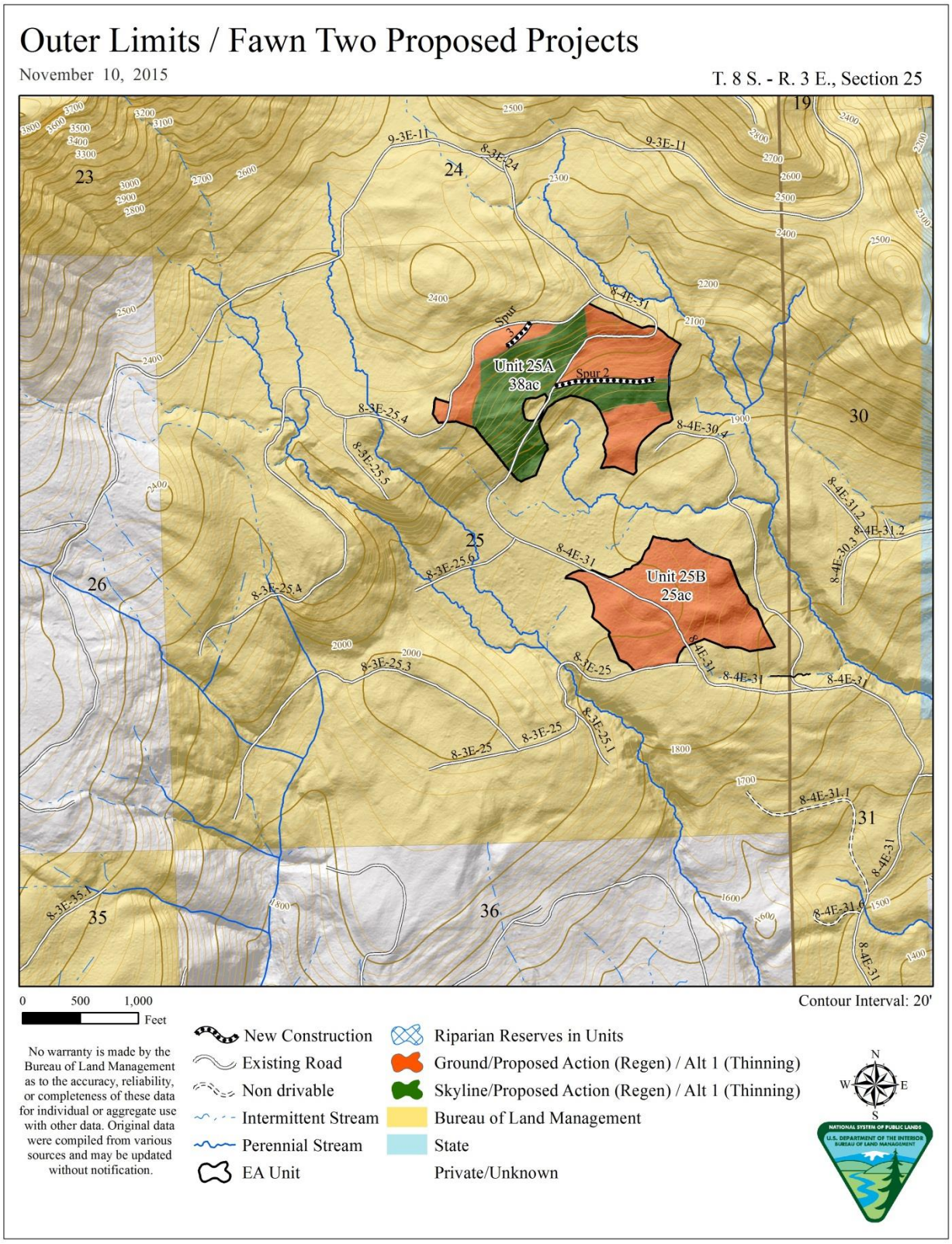


Figure 6: Fawn Two area Section 25



1.3 Purpose and Need for Action

The Salem District BLM is required by federal law and the District Resource Management Plan (RMP) to produce a sustainable supply of timber, as well as provide a range of age-classes and forest habitats across the ownership. To fulfill this need, the Cascades Resource Area is initiating this EA to explore forest management options for the Outer Limits and Fawn Two areas.

1.3.1 Need for a Timber Sale and Connected Actions

To meet requirements under the O&C Act and FLPMA

The land within the Outer Limits/Fawn Two project is in revested Oregon and California (O&C) and Public Domain (PD) lands land within the Salem District BLM. The Outer Limits/Fawn Two project responds to the need to manage revested O&C and PD lands under the statutory requirements established under the O&C Act (*43 U.S.C. §1181a et seq.),* and the Federal Land Policy and Management Act of 1976 (*FLPMA, 43 U.S. C §1701 et seq.).*

The statutory requirements of the O&C Act, which governs BLM-administered O&C lands in western Oregon, include, but are not limited to, managing the O&C lands for permanent forest production by selling, cutting and removing timber in conformance with the principles of sustained yield; determining the annual productive capacity of the lands managed under the O&C Act; and offering that determined capacity annually under normal market conditions. The statute states that the purpose of sustained yield management of these lands is to provide a sustainable timber supply, contribute to the economic stability of local communities and industries, as well as benefit watersheds, regulate stream flows, and provide recreational use (*RMP p. 2*).

The FLPMA requires that public lands be managed for multiple uses and establishes a planning process. The FLPMA does not require that every parcel be managed for every value and timber is included in these uses. The FLPMA further specifically provides that if there is any conflict between its provisions and the O&C Act relating to management of timber resources, the O&C Act prevails (*43 U.S.C. §1701*).

BLM implements forest management actions in compliance with a number of subsequent laws that direct how BLM accomplishes statutory direction. For further discussion of legal authorities which direct the proposed action alternatives see EA Section 1.7.

To meet objectives in the Salem District RMP

The Salem District RMP was developed under the requirements of FLPMA, while in compliance with other laws and statues including the O&C Act. The proposed Outer Limits/Fawn Two project has been designed to meet RMP objectives.

The Salem District RMP responds to both the need for a healthy forest ecosystem and the need for a sustainable supply of timber. "The Oregon and California Lands Act requires the Secretary of the Interior to manage Oregon and California lands for permanent forest production; however, such management must also be in accord with sustained-yield principles. Further, that Act requires that management of Oregon and California lands protect watersheds …" (*RMP pp. 1-2*)

The RMP is built around a strategy where "[l]ands administered by the BLM will be managed to maintain healthy, functioning ecosystems from which a sustainable production of natural resources can be provided. Ecosystem management emphasizes the complete ecosystem instead of individual components and looks at sustainable systems and products that people want and need.

"The building blocks for this strategy are comprised of several major land use allocations (LUA)… These land use allocations have differing management direction and are located and configured in the landscape to support overall ecosystem function and to meet the vision for management of federal lands in western Oregon…Each land use allocation will be managed according to specific objectives and management actions/direction." (*RMP pp. 4-5*) The Outer Limits and Fawn Two areas are located in the Matrix and Riparian Reserve LUA.

In the Salem District RMP, the Matrix LUA is divided into General Forest Management Areas (GFMA) and Connectivity/Diversity Blocks (CONN). The Outer Limits and Fawn Two areas are located in two separate Connectivity/Diversity Blocks within the Matrix LUA.

Approximately 89 acres proposed for thinning treatment are in the Riparian Reserve LUA in the Outer Limits area. No Riparian Reserve acres are proposed for treatment in the Fawn Two area.

General RMP Objectives for the Matrix and specific to CONN lands, and Riparian Reserve LUA which indicate the need for action include:

Matrix: Lands within the Matrix LUA, which includes CONN land, are designated to (RMP p. 20):

- Produce a sustainable timber supply to provide jobs and contribute to community stability;
- Provide connectivity between Late-Successional Reserves;
- Provide habitat for a variety of organisms associated with both late-successional and younger forests;
- Provide for important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags and large trees;
- Provide early successional habitat.

Riparian Reserve: Lands within the Riparian Reserve[6] LUA are designated to (RMP pp. 9-10):

- Restore and maintain the ecological health of watersheds and aquatic ecosystems (*RMP pp. 5-6*), Aquatic Conservation Strategy (ACS));
- Provide habitat for terrestrial species (*RMP p. 9*).

[6] The Riparian Reserve (RR) Land Use Allocation (LUA) is a defined management allocation intended to protect riparian ecosystems; provide for the aquatic, hydrologic and terrestrial functions embodied in the Aquatic Conservation Strategy Objectives (ACSO); and to provide connectivity between upland habitat blocks. Riparian Reserves include both riparian area and upland area. (RMP pp. 2, 5-6, 7-8, 9-15)

The Riparian Reserve designation overlays Matrix, which is the primary LUA throughout the project areas. When Riparian Reserve overlays the Matrix LUA, Riparian Reserve objectives and management action/direction supersede those of the Matrix LUA. The purpose of the project is described in more detail in EA section 1.4.

1.3.1.1 Need for Regeneration Harvest

On BLM O&C Lands and in the Salem District

The 2012 RMP Plan Evaluation Report[7] illustrates how western Oregon BLM districts, which manage O&C land, have departed from the assumptions of the 1995 RMP's; primarily the RMP's determination of the allowable sale quantity (ASQ[8]). The determination of ASQ in all western Oregon RMPs is based on an assumed: mix, intensity, and cycle of regeneration and thinning harvest. They base the ASQ levels for each western district on regeneration harvest of mature forest as the primary source of timber volume. Regeneration harvest conducted today provides the stands available for thinning in the future *(2012 RMP Evaluation p. 6-10).*

The Salem District's current harvest plan does not reflect the amount of regeneration harvest originally proposed and modeled for the 1995 RMP. Regeneration harvest acres were modeled in the RMP to approximate 40 percent of the acres harvested each year in the Salem District (*RMP Appendix A-1-1*).

Approximately 600 acres of regeneration harvest were expected to occur on the Salem District annually under the current RMP (*RMP Appendix A-1-1).* According to the 2012 accomplishments published in the Salem District Annual Program Summary[9], approximately 861 acres have been regeneration harvested between 2005 and 2012 on the Salem District. This is roughly 15 percent of the total amount of regeneration harvest acres projected under the RMP for this time frame. Commercial thinning accomplishments include 16,919 acres sold/awarded from 2005 to 2012 in the Salem District; roughly 206 percent of the amount projected when the RMP was published.

In the Salem District, commercial thinning in stands approximately 40-80 years of age has been the dominant method of harvest to produce timber volume for approximately 15+ years. At the current rate of harvest it is likely the Salem District, and in turn the Cascades Resource Area (RA) will exhaust most commercial thinning options in 40-80 year old stands in a little over a decade (*see Table 1*). The areas the Salem District are currently thinning, proposing to thin, and relying on to produce an obligation of timber volume for the state of Oregon on a yearly basis come from areas that were clear-cut harvested in previous decades. These stands were harvested, reforested, and in many cases thinned and fertilized; with the intention of future harvest. With very little regeneration harvest taking place on the District the last 15+ years, this

[7] BLM (2012) Resource Management Plan Evaluation Report – Western Oregon Districts. U.S. Department of the Interior, Bureau of Land Management, Oregon State Office, Portland, OR. 226 pp. Available online at: *http://www.blm.gov/or/plans/files/RMPEvaluation.pdf*

[8] Allowable Sale Quantity (ASQ): The gross amount of timber volume, including salvage that may be sold annually from a specified area over a stated period of time in accordance with the district Resource Management Plan (FEIS 6-1).

[9] BLM (2011) Salem District Annual Program Summary, Plan Maintenance and Monitoring Report, Fiscal Year 2012 http://www.blm.gov/or/districts/salem/plans/files/aps2012.pdf

supply of young managed stands, and therefore commercial thinning opportunities, cannot be sustained.

In the Cascades Resource Area

Table 1 shows a breakdown of acres available for thinning harvest in the Cascades RA from an internal analysis completed in 2011. Acres and ages associated with the forest stands were collected from the Forest Operations Inventory (FOI) data for the Salem District.

In Table 1, the following assumptions were used to determine the number of acres available for commercial thinning over a 10 year period in the Cascades RA: 1/The stands will be between 40 and 80 years of age; 2/Stands available and considered appropriate for thinning treatment have moderate to high densities of trees; 3/The stands are not already part of an active timber sale; 4/Stands have not already been commercially thinned in the last 3 decades; and 5/There is a 45 percent operational fall down[10] between actual acres and harvested acres.

Table 1. **Age class distribution within the Cascades Resource Area**

Stand Age	**Cascades RA Acres (All LUA's)**	**How long can we sustain commercial thinning in stands below 80 years in Cascades RA?:**
39-49	5186	11,790 acres X 17,000 board feet per acre[11] = 200,430,000 board feet 200,430,000 board feet / 15,000,000[12] board feet per year = **13.4 years** 200,430,000 board feet/20,000,000* board feet per year = **10.0 years.**
50-59	2705	
60-69	2046	
70-79	1852	
Available acres	11,790	

Table 1 shows in approximately one decade, the current rate of thinning will substantially reduce commercial thinning opportunities in stands less than 80 years in the Cascades RA.

In the Outer Limits/Fawn Two Project

The stands proposed for regeneration harvest in the Outer Limits/Fawn Two project area were identified based on the objectives of Matrix lands in the Salem District RMP (*RMP p. 20, 46, EA Section 1.3.1, EA Section 1.4.1*).

Areas determined appropriate for regeneration harvest according to the RMP objectives for each LUA are analyzed in Chapter 3 of this EA and compare the expected results of the proposed action alternatives to expected results if no treatment were done.

[10] 45% operational fall down is an estimate. It means for every 100 acres looked at for harvest, 55 acres will be included in an actual timber sale. Acres may be dropped from potential thinning for many reasons including but not limited to: logging difficulty, high road costs, economic unfeasibility, proximity to spotted owl habitat, survey and manage species locations etc.

[11] Approximate average volume per acre on Cascades RA commercial thinnings.

[12] In general, the Salem District expects the Cascades RA to offer 15 to 20 million board feet of timber per year to meet RMP targets and Oregon State Office budget direction

Regeneration harvest for timber production, age class distribution (RMP p. 46, D-4)

The BLM has identified specific forest stands in the project area that can be managed at this time to provide a portion of the Salem District's sustainable timber harvest, while adding to the diversity of the landscape on BLM-administered land.

BLM resource specialists on the Interdisciplinary Team (IDT) which developed this project proposal examined these stands in the field and analyzed data from Stand Exams using ORGANON growth models. Using professional judgment based on personal field work and data from modeling, they analyzed expected stand growth rates, age class distribution across the landscape, timber products yield, species composition and elements of stand structure to compare stand development with and without treatment.

Silviculture systems, including regeneration harvest, need to consider age-class distribution of forest stands on BLM lands as part of the plan to conform to the principles of sustained yield. The BLM has identified in 5th field watersheds associated with the Outer Limits/Fawn Two project an unbalanced age-class distribution across the forest on BLM lands (*see Table 2*).

The units proposed for regeneration harvest are in the early mature to mature seral stage. In the Fawn Two area, the stands proposed for harvest were previously commercially thinned and are in the mature seral stage, the highest percentage of age class on BLM land in the Little North Santiam 5th field watershed.

In the Outer Limits area, the stand proposed for regeneration is in the early mature seral stage; stand data has shown this unit to have exceptionally high densities, low diameters and low crown-ratios for its age (*see Figure 9 and stand description EA Section 3.3.1).* The crown ratios in this area average around 30 percent, with some crowns at approximately 25 percent. Once the live crown ratios decline to 25 percent or less, it becomes less likely individual trees will respond to thinning designed to maximize tree growth and stand structural development (*Tappeiner et. al 2007, see Silvliculture report, EA Section 3.3.1.1).* Stands with generally low growth rates, or stands with the least degree of late-successional forest structure would receive higher priority for regeneration harvest according the RMP direction (*RMP Appendix D-4*).

Table 2. **Age Class distribution of forest stands within Little and Middle North Santiam 5th Field Watersheds on BLM land.**

Birthdates	Seral Stages*	Age Class of forest stands	Little North Santiam 5th Field Watershed (Fawn Two): *13, 255* BLM acres		Middle North Santiam 5th Field Watershed (Outer Limits): *6,179* BLM acres	
			Acres	percent of Watershed	Acres	percent of Watershed
none	Non-forest	Non-Forest[13]	**1038**	**8%**	**343**	**6%**
2014-1985	Early Seral[14]	0-29 years	**863**	**7%**	**560**	**9%**
1984-1975	Early Mid-Seral	30-39 years	**599**	**5%**	**313**	**5%**
1974-1955	Mid-Seral	40-59 years	**2707**	**20%**	**1341**	**22%**
1954-1935	Late Mid-Seral	60-79 years	**2422**	**18%**	**1014**	**16%**
1934-1895	Early Mature Seral	80-119 years	**813**	**6%**	**1077**	**17%**
1894-1815	Mature	120-199 years	**4412**	**33%**	**371**	**6%**
1814-older	Old Growth	200+ years	**401**	**3%**	**1160**	**19%**
		Total	***13255***	***100%***	***6179***	***100%***

Data compiled from Forest Operations Inventory Data in ArcMap GIS 10.1 January, 2014.
**Seral Stage definitions based on RMP/FEIS glossary, p 6-13.*

Regeneration Harvest and early-successional habitat (RMP p. 46)

There is relatively little area of young forest on BLM-managed land in both 5th field watersheds encompassing the project area. Approximately 7 to 9 percent of the total BLM acres in both 5th field watersheds have areas of trees less than 30 years of age. In the Little North Santiam 5th field watershed, only 210 acres (1 percent) of BLM land is under the age of 20. In the Middle North Santiam 5th field watershed, 142 acres (2 percent) is under 20 years.

The historic occurrence of early-seral habitat in the western Cascades was highly variable in space and time (*Swanson et al. 2014*). Recent estimates from the western Cascades show a decrease in early-seral habitat from 5 to 2.5 percent in the Blue River area since 1946 but this baseline occurs during conversion to conifer plantations and extensive fire suppression (*Takaoka and Swanson 2008*).

Although industrial plantations remove existing forest cover and mimic a pre-forest stage, these plantations do not have beneficial early successional habitat characteristics, which include a high ratio of edge to open area, have forage species and cover, and residual legacy structure such as snags and coarse woody debris. Thus, it is not primarily the quantity of early-seral habitat that is missing from the landscape but the quality. Most private land (and public land in the recent past) has purposely simplified and accelerated pre-forest stages with herbicides or other competition

[13] "Non-Forest" acres are calculated in this instance as areas with little to no vegetation, including but not limited to: rock outcrops, brushy areas, water or roads.
[14] "Early seral" and "early-successional" are used interchangeably in this document.

reduction techniques and closely spaced conifer planting. These plantations do not provide the same ecological functions most beneficial to early-seral species (*Swanson et al. 2010; Campbell and Donato 2014*) reducing the habitat for a number of early-seral obligate species of conservation concern (*Swanson et al. 2014*).

In summary, stands proposed for regeneration harvest in this analysis will be reforested based on RMP direction (*RMP p. 47*). However, there are substantial differences between reforestation on BLM and private stands:

- Size of the harvest units - 16-63 acres BLM, private usually larger;
- Green tree retention - BLM would retain 15-22 of the largest trees per acre and retain large CWD. Private has no such requirement;
- Reforestation - private industry typically reforest quickly to occupy the site with conifers and control non-conifer vegetation with herbicides. BLM allows early-seral shrubs and forbs to grow after site preparation to reduce logging slash.

1.3.2 Need for Thinning

On BLM Lands and in the Salem District

The BLM has identified the need to manage conifer stands in Matrix lands as part of the general need to produce timber consistent with the principles of sustained yield management and ecosystem health as described in the RMP and in this EA. Some of these stands need to be managed to reduce stand density (thinned) because stand growth and development trends described in this EA reduce the overall value of timber products over the life cycle of an unmanaged stand compared to a managed timber stand. Silvicultural treatments are needed to provide timber harvest now and to provide for future timber harvest in these stands.

In the Cascades RA and the Outer Limits/Fawn Two project area

Matrix Thinning for timber productivity and stand complexity

The proposed stands for thinning treatment in the Outer Limits/Fawn Two area are currently overstocked and/or at a density where the stands are exhibiting decreasing growth. Thinning the stands in the Matrix LUA proposed in this EA would contribute to higher timber productivity and value as well as an increase in size of trees, amount of understory vegetation and canopy layering benefitting fish and wildlife species.

On CONN lands there is a need to create structural and spatial diversity by maintaining any legacy the dominant overstory trees on the landscape, and introduce early-seral habitat in gaps within the treated areas where understory development vegetation and shade tolerant species can establish. These desired traits move the proposed forest stands toward a condition that would meet the objectives defined in the Salem District RMP (*EA 1.4 and RMP pp. 46-48, Appendix D-5).* How these principles apply to the Outer Limits/Fawn Two project is discussed in Chapter 3 of this EA.

Low Density Thinning Areas and early seral habitat

The BLM has identified that openings interspersed through the interior of forest stands are a desirable component of landscape level habitat diversity and are scarce in the project vicinity. There are few small gaps/openings to provide a diversity of early serial plant species which are critical biological features for many early seral associated wildlife species.

Riparian Reserve Thinning for stand complexity

The Northwest Forest Plan (NWFP) (p. C-32) and the RMP (p.11) direct the BLM to apply silvicultural practices in the Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy (ACS) objectives. The RMP (p. D-6) states that merchantable logs may be removed "where such action would not be detrimental to the purposes for which the Riparian Reserves were established". EA section 3.3.12 describes the project's compliance with the ACS, including the nine ACS objectives. The NWFP (p. B-31) states that "active silvicultural programs will be necessary to restore large conifers in Riparian Reserves".

The BLM has also identified the need to introduce habitat variation and complexity in Riparian Reserves and to develop some habitat characteristics associated with structurally complex forests faster than they would be expected to develop in unmanaged stands. Desired characteristics include large diameter green trees, large diameter dead trees (both standing snags and down coarse woody debris), full crowns with large limbs, and understory diversity and complexity.

The following photos show examples of some of the areas proposed for harvest under the Proposed and Alternative Actions.

Figure 7: Unit 25B in the Fawn Two Area

Figure 8: Unit 17B in the Outer Limits Area

Figure 9: Unit 17A in the Outer Limits area proposed for regeneration harvest under the proposed action

1.4 Purpose (Objectives) of the Project

This project has been designed under the Salem District Record of Decision (ROD) and RMP and related documents which direct and provide the legal framework for management of BLM lands within the Salem District (*EA Section 1.7.1*).

1.4.1 Timber Harvest and Connected Actions

In this EA we describe specific objectives regarding the pertinent LUAs for the projects. Also, each resource is analyzed separately as a way to organize information, but the specific objectives and resources are all interrelated and each contributes collectively and cumulatively to meeting overall RMP objectives and management strategy. They work together and must be considered together to accurately reflect the place of this project in the concept of ecosystem management (*RMP p. 7*) and fulfilling the objectives of the O&C Act and FLPMA.

The BLM proposes thinning and regeneration timber harvest in these forests stands to implement the resource management objectives described in the RMP, the NWFP, the O&C Act and FLPMA. The RMP, NWFP and related documents direct and provide the legal framework for management of BLM lands within the Salem District (see *EA Section 1.7*).

The overall objectives defined by the O&C Act and FLPMA include:

*Overall O&C Act Objectives (***43 U.S.C. §1181a***)*

- Manage O&C Lands classified as timberlands for permanent forest production and sell, cut and remove timber in conformity with the principle of sustained yield while:
- Providing a permanent source of timber supply,
- Protecting watersheds,
- Regulating stream flow,
- Contributing to the economic stability of local communities and industries, and
- Providing recreational facilities.

Overall FLPMA Objectives (43 U.S.C. §1701 et seq)

- Manage Public Domain lands for the purpose of "Multiple use" which includes but is not limited to: recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values (*FLPMA Sec 103*)
- Any land use plan (RMP) shall observe the principles of multiple uses (*FLPMA Sec 202*).

Timber Resources Objectives (RMP pp. 46-48)

- Provide a sustainable supply of timber and other forest products by designing the project to:
  - Manage developing stands on available lands to promote tree survival and growth and to achieve a balance between wood volume production, quality of wood, and timber value at harvest.
  - Manage timber stands to reduce the risk of loss from fires, animals, insects and diseases.

Overall RMP Objectives (RMP p. 1)

- Contribute to a healthy forest ecosystem with habitat that will support populations of native species and provide protection for riparian areas[15] and waters.
- Contribute to providing a sustainable supply of timber and other forest products that will help maintain the stability of local and regional economies and contribute valuable resources to the national economy on a predictable and long-term basis.

[15] "Riparian area", as used in this EA, refers to the aquatic habitat and the terrestrial zone where biotic and hydrologic elements interact with and affect each other directly. It is basically the area where plants grow rooted in the water table of streams, springs, wet meadows, etc. Related terms include aquatic zone/habitat, riparian zone/habitat and riparian buffer zone. These related terms are sometimes used in other documents as synonyms, and sometimes to indicate specific parts or functions of the overall riparian area, especially the terrestrial part of the riparian area. (RMP/FEIS 1994, Chp. 6 p. 12; Helms (Editor), 1998, *The Dictionary of Forestry*.)
Another related term used in this EA is Stream Protection Zone (SPZ) which is designated on the ground to include the riparian area and enough additional upland area to protect habitat in the riparian area and water quality. Related terms used in other documents include: stream buffer, riparian buffer, protection buffer, no-entry buffer or no-harvest buffer.

Objectives Common to All Land Use Allocations (*RMP pp. 1, 11, 28, 62)*

- Implement an environmentally sound and economically viable timber sale that contributes to meeting the overall RMP Objectives described above and accomplishes objectives for each LUA:
  - A timber sale provides the means to accomplish the specific objectives for the project and fulfills the O&C Act requirement that "…timber…shall be sold, cut and removed…for the purpose of providing a permanent source of timber supply…and contributing to the economic stability of local communities and industries…";
  - The project needs to be environmentally sound to be successfully implemented to meet the Overall RMP Objectives.
  - The project needs to be economically viable to be successfully implemented to meet the Overall RMP Objectives.

- Protect, manage, and conserve federal listed and proposed species and their habitats to achieve their recovery in compliance with the Endangered Species Act (ESA) and Bureau special status species policies (*RMP p. 28*).
  - Maintain and develop habitat and forage for wildlife species in addition to special status species (IDT defined objective).

- Maintain and develop a safe, efficient and environmentally sound road system (*RMP p. 62*) and reduce environmental effects associated with identified existing roads within the project area (*RMP p. 11*) by:
  - Providing appropriate access for timber harvest, silvicultural practices, and fire protection needed to meet these objectives;
  - Perform road maintenance to prevent road deterioration or failure and to prevent road generated sedimentation that exceeds Oregon Department of Evironmental Quality (ODEQ) standards.

Objectives specific to the CONN and Riparian Reserve lands defined by the Salem District RMP include:

Objectives Specific to the Connectivity/Diversity lands within the Matrix LUA (RMP pp. 20-21, 25-26, 46-48, D3-5):

The Matrix LUA in the Outer Limits and Fawn Two project areas includes two CONN lands. Management actions and direction of CONN lands include the following:

- Manage developing timber stands via thinning on available CONN lands by designing the project to promote development of late-successional forest structure, while providing an output of merchantable timber and maintaining forest health and productivity (*RMP p. 20, D-4*):
  - Accelerate growth of trees which would later provide large-diameter snags and down logs.
  - Promote development of understory vegetation and multiple canopy layers.

- Produce larger, more valuable logs.
- Harvest mortality of small trees as the stand develops.
- Maintain good crown ratios and stable, wind-firm trees.
- Maintain existing large snags and down wood wherever feasible.
- Provide early successional habitat.

- Manage timber stands via regeneration harvest on available CONN lands by designing the project to produce a sustainable source of timber to maintain a well distributed pattern of early, mid- and late-successional forest across the Matrix, provide jobs and contribute to community stability (*RMP p. 20, D-3-4*):
  - Retain a minimum of 12-18 green conifer trees per acre; distribute the retained trees in variable patterns (e.g., single trees, clumps and strips).
  - Provide a renewable supply of large down logs according to RMP objectives.
  - Retain snags within harvest units at levels sufficient to support species of cavity nesting birds at 40 percent of potential population levels…on areas averaging no larger than 40 acres.
  - Maintain 25 to 30 percent of each CONN lands in late successional forest at any point in time.
  - Manage stands in each CONN lands for a 150 year rotation.
  - Provide early successional habitat.

Objectives Specific to the Riparian Reserve LUA (RMP pp. 2, 5-6, 7-8, 9-15, D-6; NWFP pp. B-31, C-32):

- Maintain and restore water quality standards, aquatic ecosystem functions and stream conditions embodied in ACS objectives 1-7 by designing the project to comply with ODEQ water quality standards:
  - Maintain effective shade for streams pursuant to BLM's agreement with the State of Oregon.
  - Develop, maintain and use new and existing roads to comply with ODEQ water quality standards for peak flows and sediment.

- Maintain and restore the species composition and structural diversity of forest plant communities embodied in ACS objectives 8 and 9 by designing the project to apply silvicultural treatments in the Riparian Reserve to develop forest stand characteristics that maintain and/or restore the hydrology and sediment regimes of the watershed:
  - Apply silvicultural treatments in the Riparian Reserve to provide a diverse vegetation community to provide riparian and wetland functions and habitat to support populations of riparian-dependent plant and animal species.
  - Apply silvicultural treatments in the Riparian Reserve to develop long-term structural and spatial diversity, and other elements of late-successional forest habitat.

- Conduct thinning operations to develop large conifers and hardwoods for habitat and to recruit future large coarse woody debris, large snag habitat and in-stream large wood.

1.5 Decisions to be Made

The following decisions will be made through this analysis:

1. To determine at what level, where, and how to implement regeneration harvest on BLM-administered lands to meet Matrix LUA objectives and timber resources objectives.
2. To determine at what level, where, and how to thin trees on BLM-administered lands to meet Matrix and Riparian Reserve LUA objectives and timber resources objectives within the project area.
3. To determine at what level, where and how to meet ACS objectives within Riparian Reserves in the project area.
4. To determine at what level, where, and how to implement the connected actions.

1.6 Decision Factors

In choosing the alternative that best meets the purpose and need, the Cascades RA Field Manager will consider the extent to which each project and each associated alternative would:

1. Provide timber resources and revenue to the government for those resources, while reducing costs both short-term and long term of managing the lands in the project area.
2. Provide for a sustainable supply of timber and other forest products on a predictable and long term basis.
3. Provide habitat for special status, special attention and other terrestrial species.
4. Provide habitat for a variety of organisms associated with both late-successional and early successional forest.
5. Provide for the establishment and growth of conifer species while retaining structural habitat components, such as large trees, snags and coarse woody debris.
6. Maintain water quality, hydrologic processes, and aquatic/riparian habitat that will support populations of native aquatic and riparian plant and animal species.
7. Reduce erosion and subsequent sedimentation from roads, while providing safe, cost-effective access for logging operations, fuels management, reforestation, stand maintenance, fire suppression and public use of the land.

1.7 Conformance with Land Use Plan, Statutes, Regulations, and other Plans

The BLM has designed these projects to comply with the O&C Act and other relevant statutes and authorities (*see EA Section 1.7.1*) and the Salem District Record of Decision and RMP, May 1995 and related documents, which direct and provide the legal framework for management of BLM lands within the Salem District.

In summary, the project conforms to the:

1. *O&C Act, 1937:* The O&C Act governs BLM-administered O&C lands in western Oregon. It requires BLM to manage O&C lands for permanent forest production, in accord with sustained-yield principles to protect watersheds, regulate stream flow, provide for recreational facilities, and contribute to the economic stability of local communities and industries. The proposed project is designed to contribute to the objectives of the O&C Act as described in EA Section 1.4., 1.7.1.
2. *Salem District Record of Decision and RMP*, May 1995: The RMP has been reviewed and it has been determined that the proposed thinning activities conform to the land use plan terms and conditions. Implementing the RMP is the reason for doing these activities (*RMP pp.1-3*).
3. *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl,* April 1994 (the Northwest Forest Plan, or NWFP), as reflected in the Salem District RMP.
4. *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines,* January 2001 (2001 ROD). Surveys, monitoring and project design were planned to comply with the 2001 ROD.

The IDT incorporated information from the Little North Santiam Watershed Analysis (1997) and the North Santiam River Watershed Assessment (2002) into the development of the proposed thinning, regeneration harvest activities and connected actions and into the description of the affected environment and environmental effects (see *EA Chapter 3*) and is hereby incorporated by reference.

The above documents are available for review in the Salem District Office. Additional information about the proposed activities is available in the Outer Limits/Fawn Two EA Analysis File, also available for review at the Salem District Office.

Survey and Manage Species Review

The project analyzed in this EA is designed to be consistent with the *2001 ROD and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines*, as incorporated into the Salem District RMP.

This project utilizes the December 2003 species list. This list incorporates species changes and removals made as a result of the 2001, 2002, and 2003 Annual Species Reviews (ASR) with the

exception of the red tree vole. For the red tree vole, the Ninth Circuit Court of Appeals in *KSWC et al. v. Boody et al*., 468 F3d 549 (9th Cir. 2006) vacated the category change and removal of the red tree vole in the mesic zone, and returned the red tree vole to its status as defined in the 2001 ROD Standards and Guidelines, which makes the species Category C throughout its range.

1.7.1 Relevant Statutes/Authorities

This section is a summary of the relevant statutes/authorities that apply to these projects. The BLM designed all three projects to conform to these statutes and authorities.

- Federal Land Policy and Management Act (FLPMA), 1976 –Defines BLM's organization and provides the basic policy guidance for BLM's management of public lands.
- National Environmental Policy Act (NEPA), 1969 – Requires the preparation of EAs or EISs on federal actions. These documents describe the environmental effects of these actions and determine whether the actions have a significant effect on the human environment.
- Endangered Species Act (ESA), 1973 – Directs Federal agencies to ensure their actions do not jeopardize threatened and endangered species.
- Clean Air Act (CAA), 1990 – Provides the principal framework for national, state, and local efforts to protect air quality.
- Archaeological Resources Protection Act (ARPA), 1979 – Protects archaeological resources and sites on federally-administered lands. Imposes criminal and civil penalties for removing archaeological items from federal lands without a permit.
- Clean Water Act (CWA), 1987 – Establishes objectives to restore and maintain the chemical, physical, and biological integrity of the nation's water.
- Healthy Forests Initiative (HFI), 2002 - Focuses on reducing the risk of catastrophic fire by thinning dense undergrowth and brush in priority locations that are identified on a collaborative basis with selected Federal, state, tribal, and local officials and communities. The initiative also provides for more timely responses to disease and insect infestations.
- Migratory Bird Treaty Act, 1918 - Protects migratory birds (16 U.S.C. 703).
- Executive Orders 11644 (1972) and 11989 (1997) - Direct the BLM to control off-road vehicle use so as to protect public lands.
- Executive Order 13443 (2008) - Facilitation of Hunting Heritage and Wildlife Conservation: directs the BLM and other Federal Agencies to "facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat".

Additional authorities and management direction are described in EA Section 3.3.11, Table 26. Additional details pertaining to statutes, authorities and management direction are presented in the discussions of specific resources throughout the remainder of this EA.

1.8 Scoping and Identification of Relevant Issues

1.8.1 Scoping

The IDT of BLM resource specialists conducted internal scoping through the project planning process, which includes record searches, on-site field examinations of the project area by IDT members, professional observation and judgment, literature review and IDT discussion. In the project planning process the IDT considered elements of the environment that are particular to this project as well as elements of the environment that are common to all similar timber management projects.

The BLM conducted external scoping for this project by means of a scoping letter sent out to approximately 75 federal, state and municipal government agencies, nearby landowners, tribal authorities, and interested parties on the Cascades RA mailing list on October 22nd, 2014. The BLM received 6 comment letters/emails during the scoping period.

The scoping comment letters and emails are available for review at the Salem District BLM Office, 1717 Fabry Rd. SE, Salem, Oregon. A detailed listing of scoping comments was prepared as a separate report and is available for review with the scoping comment letters and emails. The IDT considered scoping comments in developing the list of relevant issues to be analyzed in this EA (*see EA Section 1.8.2*)

1.8.2 Relevant Issues

The IDT identified relevant issues based on applicable law, management direction contained in the RMP, and information gathered during the scoping and project planning process. Issues are considered to be relevant if they determine the appropriate range of alternatives to analyze, determine whether the proposed action should be modified, and determine the significance of the project's effects on elements of the environment. Analysis of these issues provides a basis for comparing the environmental effects of alternatives, including the No Action Alternative, and aids in the decision-making process.

The IDT considered the following issues as it developed and refined the project alternatives, identified project design features (PDF), analyzed the environmental effects, and reviewed scoping comments.

Issue 1: The Effects of Management Actions on Vegetation and Forest Stand Characteristics

1/How proposed management actions would change vegetation and forest stand characteristics, both short term and long term and how these changes would affect attainment of objectives for each LUA. 2/How proposed management actions would affect "legacy features" including snags, coarse woody debris, remnant large tree habitats. 3/How proposed management actions would affect structural complexity, including overstory, understory, dead wood and spatial complexity. 4/How proposed management actions would affect identified populations with special status (T&E, Survey and Manage, sensitive, etc.). The elements of this issue are addressed in the following sections of this EA: 2.3.1, 2.3.2, 3.3.1, 3.3.5.

Issue 2: The Effects of Management Actions on Water Quality and Hydrology– Including Achieving Related Aquatic Conservation Strategy Objectives

1/How proposed management actions would affect water quality including sediment from roads, sediment from forest management activities, sediment from landslides, sediment caused by unauthorized Off Highway Vehicle (OHV) use, and water temperature. 2/How proposed management actions would affect stream channels. 3/How proposed management actions would affect water quantity (peak flows). 4/How any proposed increase in road densities would affect a Key Watershed (Fawn Two). The elements of this issue are addressed in the following sections of this EA: 1.1., 2.3.1, 2.3.2, 3.3.1, 3.3.2, 3.3.3, 3.3.4.

Issue 3: The Effects of Management Actions on Fisheries, and Aquatic and Riparian Habitats - Including Achieving Related Aquatic Conservation Strategy (ACS) Objectives

1/How proposed management actions would affect ESA listed fish, resident fish, and aquatic habitat. 2/How proposed management actions would comply with ACS Objectives in the Riparian Reserve and regeneration harvest areas outside the Riparian Reserve. 3/How proposed management actions would affect stability of steep slopes above streams. 4/How proposed management actions would affect large wood recruitment. The elements of this issue are addressed in the following sections of this EA: 1.1., 2.3.1, 2.3.2, 3.3.2, 3.3.3

Issue 4: The Effects of Management Actions on Soils and Site Productivity

1/How proposed logging operations would affect soil compaction, disturbance and erosion and their effects on site productivity. 2/How proposed road construction would affect site productivity. 3/How proposed harvest and site preparation would affect site productivity. The elements of this issue are addressed in the following sections of this EA: 1.1, 2.3.1, 2.3.2, 3.3.1, 3.3.4

Issue 5: The Effects of Road Management Actions on Resources and Operability

1/How proposed road management operations construction, improvement, renovation, maintenance, and culvert replacement/installation would affect site productivity, water quality, fisheries and aquatic habitat, wildlife habitat, weed management, fire management, and public safety and use. 2/How proposed road closures and stabilization would affect site productivity, water quality, fisheries and aquatic habitat, wildlife habitat, fire suppression access, and public safety and use. The elements of this issue are addressed in the following sections of this EA: 3.3.1, 3.3.2, 3.3.3, 3.3.4, 3.3.5

Issue 6: The Effects of Management Actions on Wildlife Populations and Habitats

1/How proposed management actions would affect protection of terrestrial animals with special status (T&E, Survey and Manage, sensitive, etc.) and their habitats, including suitable habitat or critical habitat for the northern spotted owl. 2/How proposed management actions would affect protecting and providing habitat and forage for terrestrial animals, including big game, that do not have special status. 3/How proposed management actions would affect or enhance early successional habitat. The elements of this issue are addressed in the following sections of this EA: 3.3.1, 3.3.5

Issue 7: The Effects of Management Actions on Fire Hazard, Fire Suppression Capabilities, and Air Quality

1/How proposed management actions would affect potential wildfire ignition, intensity and resistance to control. 2/How proposed fuel reduction would affect air quality. The elements of this issue are addressed in the following sections of this EA: 2.3.1, 2.3.2, 3.3.6

Issue 8: The Effects of Management Actions on Public Safety and Public Use of the Areas

1/ How proposed management actions would affect public safety, visual resources, recreation and public access. 2/How logging, road construction, road closure and related actions would affect unauthorized OHV use. The elements of this issue are addressed in the following sections of this EA: 2.3.1, 2.3.2, 3.3.8

Issue 9: The Effects of Management Actions on Sustainable Supplies of Timber to Provide Jobs and Contribute to Community Stability

1/How proposed management actions would affect sustainable timber supplies in the short and long term with the distribution of age class changes on the landscape. 2/How proposed project design features would affect the economic viability of the project. The elements of this issue are addressed in the following sections of this EA: 1.3.1, 1.4.1, 2.3.1, 2.3.3, 3.3.1

Issue 10: The Effects of Management Actions on Carbon Emissions and Carbon Storage

1/How proposed management actions would affect carbon emissions and carbon storage on a local, regional and global scale. The elements of this issue are addressed in EA 3.3.7

1.8.3 Issues Considered, Not Analyzed in Detail

Update RMP Matrix Objectives: The IDT for the Outer Limits/Fawn Two project did not analyze potential changes to RMP Matrix objectives or management direction because it is outside of the scope of the Outer Limits/Fawn Two project EA. The FLPMA requires BLM to manage public lands in accordance with the applicable land use plan, which is the Salem District RMP. The FLPMA does not require agencies to revisit an RMP each time an EA is prepared for an action implementing the RMP. The IDT reviewed the public scoping comments and supporting documentation presented and has analyzed the Outer Limits/Fawn Two project based on available data, field reviews and current scientific information applicable to assessing the effects to resources and to the quality of the human environment. The appropriate vehicle for updating land use allocations and objectives is the ongoing plan revision.

Changes to policy on Private Timber Land: The IDT for the Outer Limits/Fawn Two project did not analyze proposed changes to forest practices on adjacent private timber land. Comments received during scoping suggesting changes in private land forest policy to support objectives regarding early seral habitat on a landscape scale. A cumulative affects analysis for each alternative is discussed in Chapter 3 of this EA, and incorporates current and reasonable foreseeable forest management actions on adjacent private and other public lands within the project vicinity (*see EA Section 3.2*). However, the BLM has no influence or authority to modify any law or policy related to forest management on private lands. This issue is outside the scope of the Outer Limits/Fawn Two project.

Chapter 2: Alternatives

2.1 Alternative Development

Pursuant to Section 102 (2) (E) of the National Environmental Policy Act (NEPA) of 1969, as amended, Federal agencies shall "…study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources."

BLM has identified a Proposed Action and one Alternative Action to analyze along with the No Action Alternative (*see EA Section 2.3*).

The IDT developed a Proposed Action which includes regeneration harvest on 79 acres of forest stands, and thinning on 289 acres of forest stands, with 3 acres of clearing for new road construction. The IDT developed this Proposed Action to produce, over time, forests which have desired distribution of seral or age classes (*RMP p. 46-47*), to contribute to local, state and national economies by increasing the economic efficiency of timber harvest; to offer a higher volume of timber for sale; and to provide early seral habitat (*RMP p. 20*).

The IDT also developed an Alternative Action which includes thinning on all proposed forest stands (368 acres), with similar road construction as the Proposed Action. The IDT developed the alternative action to provide a sustainable supply of timber in the near term (approximately five years) by contributing to the Salem District annual ASQ (*RMP p. 46, 47*) and in the long term (several decades*)* by managing developing forest stands to meet future timber harvest and other objectives *(see EA Section 1.4*).

2.2 Planning and Implementation Process

BLM planned this project, including the two action alternatives (*see EA Section 2.3*), using an IDT process. An IDT composed of experienced professional resource specialists developed and analyzed the Proposed and Alternative Actions, connected actions, project design features and mitigation measures. The IDT requested comments from the public and other interested parties and agencies during this process through "scoping" (*see EA Section 1.8.1*) and considered these comments when developing and analyzing the alternatives. The IDT analyzed the alternatives in specialist reports which are incorporated into this EA by reference. The IDT leader developed this EA from those reports. The IDT has reviewed this EA and now invites the public to review and comment on the project alternatives and information presented in this EA (*see EA Section 5.3*).

The IDT and the Decision Maker will evaluate and incorporate information from this process into the final project design, or selection of the No Action alternative, which will be described in the Final Decision Record and Rationale (DR), to be published later. The Proposed Action and Alternative Action, including the project design features (PDF), form the best management practices (BMP) developed on a site-specific basis for the projects analyzed in this EA (*RMP Appendix C, RMP/FEIS Appendix G).*

BLM proposes to implement the Outer Limits/Fawn Two project as multiple timber sales. In this analysis the proposed treatment units are divided into two areas for analysis and discussion: Outer Limits and Fawn Two (*see EA Section 1.2*). These areas may be further divided into multiple timber sales for implementation.

For each timber sale, BLM would determine the final boundaries of the timber sale units and designate which trees would be retained and which trees would be cut and removed. BLM would develop the timber sale contracts to implement the actions selected from the Proposed Action, Alternative Action, connected actions and the PDFs analyzed in this EA. The timber sale contract would require the operator to accomplish the preventive and restorative practices analyzed in this EA. In all timber sale contracts, BLM enforces compliance through normal contract administration procedures where performance is monitored by authorized BLM personnel. The Contracting Officer enforces compliance with the contract and would suspend operations if the operator fails to perform the required preventive and restorative practices. BLM timber sale contract requires bonding in an amount sufficient for BLM to complete restoration work if the operator fails to perform the contract requirements.

2.3 Alternatives Developed

The Proposed and Alternative Actions were developed by BLM to provide for sustained yield of timber products both immediately (within approximately five years) and for several decades. Stand conditions, the expected effects of the Proposed and Alternative Actions, and the expected effects of taking no action will be described in detail in Chapter 3 of this EA.

Timber Harvest and Connected Actions

2.3.1 Proposed Action

In the Matrix (CONN):

BLM proposes to thin approximately 289 acres of 76-101 year old forest stands within the CONN portion of the Matrix LUA. The proposed thinning will reduce stand density by implementing a "thin from below" [16] prescription. The BLM also proposes to regeneration harvest 79 acres of 93-134 year old forest stands within the CONN portion of the Matrix LUA. Approximately 3 acres will be cleared of vegetation for new road construction (*see Table 3, 4*). For Matrix objectives, refer to EA Section 1.4.1.

In all areas, for both thinning and regeneration harvest areas, the prescription proposed to:

- Retain large (over 15 inches diameter and over 15 feet tall) snags in the harvest area and protect them from damage as much as feasible during timber harvest activities;
- Retain large (over 20 inches diameter and 20 feet long) down logs in the harvest area and protect them from damage as much as feasible during timber harvest activities;
- Retain all merchantable hardwood species (over 7 inches in diameter); these trees do not count toward the green tree retention requirement. Some hardwoods may be cut and left on site to facilitate logging along roadsides or other areas;
- Retain large remnant trees and generally protect them from logging damage. Individually designate such trees that are found inside unit boundaries for retention;
- Retain trees which have been identified as part of Salem's tree improvement program.

[16] A "Thin from below" prescription generally designates trees to be retained based on a combination of tree size, crown position, spacing, species mix, vigor and potential log quality. The intention of a thin from below prescription is to make light, water and nutrients available for healthy growth of those trees retained.

For the areas to be ***thinned from below,*** the prescription proposes to:

- Reduce trees per acre (TPA) densities from ~159-328 currently down to 48-118 trees per acres and relative densities (RD) of ~ 65-80 down to ~ 29-35 RD post treatment (*see EA Table 15*);
- Retain the largest, healthiest and best formed dominant and co-dominant trees;
- Maintain a mix of conifer tree species, favoring western red cedar, and noble fir where present;
- Favor retaining Douglas-fir over western hemlock except where Douglas-fir is not present;
- Implement one, 3 acre low density (15-18 green trees per acre) thinning area in Section 29 of the Outer Limits area (*see Maps EA 1.2*). Treat slash in this area for recruitment of grasses, forbs, deciduous shrub, understory vegetation and ground cover;
- Maintain an average canopy closure of 45-55 percent in Section 29 of Outer Limits, and 60 percent in section 17 of Outer Limits;
- Implement ¼ acre skips in Unit 17B in the Outer Limits area to retain advanced western hemlock regeneration;
- In Unit 17B in the Outer Limits area emphasize marking any trees over 32" DBH;
- Intentionally leave some deformed, forked topped or broken top trees for future stand complexity.

For Areas to be ***Regeneration Harvested*** the prescription proposed to:

- Retain a minimum of 16-22 green conifer trees per acre in the Fawn Two area for recruiting snags and CWD and developing a large green tree component;
- Retain a minimum of 15-18 green conifer trees per acre in the Outer Limits area for recruiting snags and CWD and developing a large green tree component.
- Retain the largest trees in the stand; emphasize marking any trees over 36 inches in diameter.
- Distribute marked trees in both a scattered and clumped pattern;
- In the Fawn Two area (Section 25), all trees marked for retention should be a minimum of 20 inches DBH where available. Trees less than 20 inches DBH may be retained if needed to protect existing large snags, or as part of a larger "clump".
- Retain a mix of conifer species, favoring western red cedar where present; Retain Douglas-fir over western hemlock except where Douglas-fir is not present;
- In Fawn Two, maintain canopy closure of 30 percent averaged over the treated area;
- Intentionally leave some deformed, forked topped or broken top trees for future stand complexity
- Create up to 2 snags per acre by base girdling or topping after harvest operations are complete to increase snag and CWD habitat in the future stand; and
- Reforest with approximately 440 conifers per acre after harvest operations and site preparation are complete.

In the Riparian Reserve LUA:

No acres within the Riparian Reserve LUA will be treated in the Fawn Two area.

BLM proposes to thin approximately 89 acres of dense, uniform 76-101 year old forest stands in the Outer Limits area as one part of a management prescription to increase forest stand structural diversity within the Riparian Reserve. Specifically, the prescription proposes to:

- Thin up to 14 percent of the Riparian Reserve acres in the project vicinity and retain a minimum 50 percent canopy cover;[17] Retain a minimum 60 percent canopy cover in unit 17B;
- Reduce TPA densities from ~159-328 currently down to 48-118 trees per acres and RD of ~ 65-80 down to ~ 29-35 RD post treatment;
- Maintain a mix of tree species, retaining as much as feasible western red-cedar, hardwoods, and favoring noble fir where present;
- Some of the low-density thinning area may be partly implemented within the Riparian Reserve to increase species and structural diversity, provide habitat for terrestrial species and/or enhance special habitats adjacent to treated areas;
- No treatment of approximately 86 percent of the Riparian Reserve in the project vicinity, allowing these stands to develop naturally and provide a different element of complex stand structure at the landscape level. These untreated areas in the Riparian Reserve include:
  - Stream protection zones (SPZ) – strips of untreated forest adjacent to streams;
  - Potentially unstable slopes;
  - Areas where stand structure already provides, or is developing, desired levels of structural complexity without silvicultural treatment;
  - Areas where logging is not feasible; and
  - Wetlands and areas with high water tables ("wet areas")

[17] There are several terms to describe how much of the area above the ground is occupied by tree crowns. Some of the terms used in this EA and other documents which are incorporated by reference include: Wildlife reports tend to use the term "canopy cover" where vertical projections from the ground may give results of more than 100 percent canopy cover due to multiple canopy layers. Hydrology reports tend to use "crown closure" to indicate the percentage of vertical projections that hit foliage rather than are open to the sky. Fire and fuels reports refer to crown density or crown bulk density as an indicator of how much potential fuel is in the canopy and silviculture reports focus on several measures of how fully trees are occupying the site.

Table 3. **Proposed and Alternative Actions: Harvest Acres by Land Use Allocations, Logging Systems and Prescription**

Acres by RMP Land Use Allocation, Alternative, Logging System and Prescription													
Outer Limits Area			**Matrix (CONN) LUA**						**Riparian Reserve LUA**				
T.S. R. E. Section, Units	*Total Acres*	*Stand Age*	*GB**	*SKY***	*Helicopter*	*Proposed Action*	*Alternative Action*	*Total Matrix*	*GB**	*SKY***	*Helicopter*	*Prescription (all alt.)*	*Total RR*
T10S, R4E Sec. 17, **Unit 17A**	16	93	0	16	0	Regeneration Harvest	Thin From below	16	0	0	0	None	0
T10S, R4E Sec. 17, **Unit 17A**	46	89	28	13	0	Thin from below	Thin from below	41	0	5	0	Thin from below	5
T10S, R4E Sec. 17, **Unit 17A**	7	101	3	3	0	Thin from below	Thin from below	6	0	1	0	Thin from below	1
T10S, R4E, Sect 17, **Unit 17A**	2	101	2	0	0	Right-of-Way[#]		2	0	0	0	None	0
T10S, R4E Sec. 17, **Unit 17B**	28	91	0	21	0	Thin from below	Thin from below	21	0	7		Thin from below	7
T10S, R4E Sec 29, Unit **29A**	55	76	0	0	37	Thin from below	Thin from below	37	0	11	7	Thin from below	18
T10S, R4E Sec 29, Unit **29B**	56	76	6	0	36	Thin from below	Thin from below	42	10	3	1	Thin from below	14
T10S, R4E Sec 29, Unit **29C**	28	76	1	4	10	Thin from below	Thin from below	15	1	11	1	Thin from below	13
T10S, R4E Sec 29, Unit **29D**	18	76	1	4	0	Thin from below	Thin from below	5	3	10	0	Thin from below	13
T10S, R4E Sec 29, Unit **29E**	37	76	12	9	2	Thin from below	Thin from below	23	10	1	3	Thin from below	13
T10S, R4E Sec 29, Unit **29F**	14	76	0	0	10	Thin from below	Thin from below	10	0	0	4	Thin from below	4
Subtotal	**307**		**53**	**70**	**95**			**218**	**24**	**49**	**16**		**89**

Table 3 Continued:

Acres by RMP Land Use Allocation, Alternative, Logging System and Prescription													
Fawn Two Area			**Matrix (CONN) LUA**						**Riparian Reserve LUA**				
T.S. R. E. Section, Units	*Total Acres*	*Stand Age*	*GB**	*SKY***	*Helicopter*	*Proposed Action Prescription*	*Alt. Action Prescription*	*Total Matrix*	*GB**	*SKY***	Helicopter	*Prescription*	*Total RR*
T8S, R3E Sec 25A	38	134	12	26	0	Regeneration Harvest	Proportional Thin[18]	38	0	0	0	None	0
T8S, R3E, Sec 25A	1	134	1	0	0	Right-of-Way		1	0	0	0	None	0
T8S, R3E Sec 25B	25	134	25	0	0	Regeneration Harvest	Proportional Thin	25	0	0	0	None	0
Subtotal	**64**		**38**	**26**	**0**			64	0	0	0		0
Total for both Areas	**371**		**91**	**96**	**95**			**282**	**24**	**49**	**16**		**89**

*GB = Ground based logging systems
**SKY = Skyline or Helicopter logging system
[#] Right-of-Way is new road construction (see Table 4, 6)

[18] See Alternative Action (EA 2.3.1.2)

Logging Systems

BLM developed a basic logging systems plan (*see Logging Report and Table 3 of this EA*) designed to comply with the RMP and be economically feasible, environmentally sound, use equipment and logging systems known to be commonly available in the area, and comply with BLM timber sale contract provisions and administration. There are many combinations of specific equipment and operating methods which could be used during implementation of logging. The final logging systems plan implemented may be different than the plan outlined in this EA. However, this EA analyzes logging system methods with the highest possible level of impact to resources, which allows for adequate analysis and flexibility in the methods used for implementation within all recognized options.

Where there are recognized options, such as an area which may be logged with either ground based, skyline systems or by helicopter, the EA analyzes, and illustrates on associated maps (*see EA Section 1.2, Maps*) the logging system with the highest potential impact. These logging plans would analyze other logging systems, subsystems and methods which may be proposed by operators to ensure that the specific impacts and effects are within the scope of the impacts and effects analyzed in this EA. When BLM determines that the impacts and effects are within the scope analyzed in this EA, BLM would document the determination and approve the proposed logging plan.

Examples of this principle include:

- Skyline yarding generally has less impact than ground based logging, so skyline yarding an area analyzed for ground based would generally be approved.
- Helicopter yarding generally has less impact than ground based or skyline yarding, so helicopter yarding an area analyzed for either ground based or skyline would generally be approved.
- Not building a road generally has less impact than building it, so a logging plan that avoids building a road would generally be approved.
- A rocked road surface is generally more stable than a natural surface road, so rocking a road would generally be approved when it is not analyzed for decommissioning after use.
- Hand falling generally has less impact than mechanized falling with a processor, so hand falling would generally be approved.
- Relatively few but larger landings or relatively many but smaller landings than anticipated would generally be approved because the total area impacted would be similar.

Some proposed logging plans may have some elements which would reduce impacts while other elements would increase impacts. For example: a proposal to extend or add a road spur (increased impacts) to skyline yard an area analyzed for ground based logging (decreased impacts); or a proposal to lengthen one road and shorten another; or to modify a road location would be evaluated by BLM to determine if the impacts and effects would be within those analyzed. If so, the change would generally be approved. Minor adjustments to boundaries and acreages between logging systems in a unit would not be documented because they would not have any potential to change the analysis or effects.

Connected Actions

Table 4. **Connected actions: Road Work, and Culverts on BLM-administered lands**

Action	Associated Unit		Miles		Description/Notes	After the project
Roads	**Outer Limits**	**Fawn Two**	**Outer Limits**	**Fawn Two**		
New road construction, natural surface, not rocked	17A,	n/a	0.31	n/a	Road not to be rocked, natural surface only. Includes clearing vegetation in the road right-of-way using ground based logging equipment. Clearing would average less than 30 feet wide. To be decommissioned after operations are completed.	Decommission See EA p. 50
New road construction, may rock	n/a	25B	n/a	0.25	Road that may include rocking. Clearing is same as described for not-rocked new construction described above	Stabilize and Close, or Decommission if not rocked
Maintain Existing Road	All units	25A, 25B	22.62	2.93	Existing useable road, including haul, maintenance operations and added rock. May include blading and shaping the road, cleaning ditches and culverts, replace/install culverts, and cutting roadside brush.	Road will remain open
Renovate Existing Road	17A, 29A, B, C, D, E	n/a	3.16	n/a	Existing subgrade, not maintained to current safety standard. Road brought up to original design standard. To be stabilized where appropriate after operations and remain open to vehicle traffic.	Stabilize, remain open
Culverts and Stream Crossings	**Associated Unit**		**Number of culverts**		**Description/Notes**	**After the Project**
	Outer Limits	**Fawn Two**	**Outer Limits**	**Fawn Two**		
Install or replace culvert, cross drain, no stream.	State haul rd., 29A, B, C, D, E	25A	4	4	Cross drain culverts. Installed during the dry season.	Culverts would remain in place.
Install or replace culvert, live stream crossing	29C-E	n/a	12	n/a	Live stream culverts will be installed/replaced during in-water work window. 2 culverts will be removed after haul for unit 29E	Culverts would remain in place

Road work

Roads would be maintained, renovated or constructed as shown in Tables 4 and 5 to provide access for safe and efficient logging and hauling.

All newly constructed roads in the Fawn Two area would have the option to be rocked at the purchaser's expense. If the purchaser chooses to not rock the new roads, they must decommission any new natural surface roads after operations as described below.

Rock Source

Pit run rock, aggregate, soil and boulders for use on project roads and berms would be obtained from commercial sources and established BLM quarries.

Road work done in the Outer Limits area may use a rock source from established USFS and/or Oregon Department of Forestry (ODF) quarries and commercial sources.

Decommissioning

New road construction not rocked in Outer Limits area

All newly constructed roads where no rock would be applied in the Outer Limits area would be decommissioned after harvest operations and fuels treatments area complete. Decommissioning of new roads on BLM-administered land in Outer Limits would include the following:

- Earth and debris barricades would be placed at main road junctions to prevent vehicle access;
- Waterbars would be constructed where appropriate along the road bed to re-establish natural drainage patterns and re-direct water flow off the main road bed and onto stable vegetated slopes.
- The roads may or may not be tilled (decompacted); and
- Roads would be seeded with native species to vegetate disturbed soil, or covered with logging slash and debris to provide additional stability and blocked to prevent vehicle use.

New road construction not rocked in Fawn Two area

All newly constructed roads where no rock would be applied in the Fawn Two area would be decommissioned after harvest operations and fuels treatment are complete. Decommissioning of new roads on BLM-administered land in Fawn Two would include the following:

- Earth and debris or trench and berm barricades would be placed at main road junctions to prevent vehicle access;
- Any culverts would be removed;
- Waterbars would be constructed where appropriate along the road bed to re-establish natural drainage patterns and re-direct water flow off the main road bed and onto stable vegetated slopes; and
- The roads would be tilled (decompacted) to provide surface roughness, reforested with native vegetation and/or conifer species, or seeded with native grass species to provide additional stability.

Stabilize and Close

New road construction rocked in Fawn Two and Outer Limits areas

Road subgrade would be waterbarred and closed to vehicle traffic after harvest operations and fuels treatment are complete. BLM is in compliance with the "no net increase in road mileage" in the Little North Santiam Tier 1 Watershed (Fawn Two area only) because there is a net decrease in road mileage during the RMP planning cycle. The BLM decommissioned approximately 1.44 miles of existing roads in the Little North Santiam River Tier 1 watershed in 1999, and 0.52 miles in 2003-2004. Approximately 0.29 miles of road was constructed for the Power Mill Thinning Sale in the watershed, offered in 2010. The total decommissioned road miles for the Little North Santiam River Watershed are now approximately 1.67 miles (*see EA 3.2, Cumulative Actions*).

Landings

The BLM would require the timber sale operator to construct ground based, skyline and helicopter landings according to the approved logging plan (*see PDF introduction and PDF numbers 4-6, 8, 23 and 24*). All landings would be located primarily on and adjacent to roads. Vegetation would be cleared for the landing and immediately adjacent to the landings to permit swinging and stacking logs for sorting and loading, and for piling logging slash and debris.

Up to four Helicopter landings will be located on BLM Matrix land, and/or private and/or ODF land in the Outer Limits vicinity. The landings for helicopters would be located on and adjacent to existing roads, and approximately 1 to 3 acres. Any helicopter landings on BLM land would remain outside Riparian Reserve areas and occur in established BLM harvest units; potential landing acres are incorporated into the total harvest acres in this analysis.

Vegetation would be removed where needed to permit landing of logs brought in by the helicopter, as well as processing the logs, sorting, loading and piling slash and debris. Areas already cleared of vegetation (such as large road turnouts, junctions, or rock pits) would be emphasized for helicopter landing and service use. Helicopter landings would be decommissioned where needed after harvest operations and site preparation are complete. Logging slash in these landings may or may not be burned after operations; decommissioning helicopter landings would include tilling (decompacting) of the landings where appropriate and/or covering the area with logging slash and debris to provide additional stability and blocked to prevent vehicle use. Decommissioned helicopter landings would be seeded and/or planted with native vegetation.

Other landings used to log the proposed regeneration harvest areas may be slightly larger than the landings used to log the same area under the Alternative Action (only thinning) due to the need to deck more logs awaiting transportation to the mill. The portion of the landings used for equipment operation would be the same size as for thinning, but more adjacent areas may have understory vegetation cleared for decking logs.

Fuels Treatments

Fuel reduction treatments would be conducted in selected areas to reduce the potential for human caused wildfire ignition, to reduce the potential for wildfire to cross property lines between BLM and private land, and to reduce both the intensity and severity of potential wildfires in the long term (compared to untreated fuels).

Fuel reduction treatments may include hand, machine, and landing pile construction; covering portions of piles with plastic sheeting; and burning piles within treatment areas, along roads, or along property lines. In the regeneration harvest units broadcast burning would be conducted for hazard fuel reduction and site preparation. Approximately 12,000 feet of fire trails would be constructed by hand around the forested borders of the regeneration harvest units. Fire trails would consist of an area up to ten feet wide where fuels would be removed and a trail approximately two feet wide constructed to mineral soil within the fuel clearing area.

Other options include slash pullback, slashing, lopping and scattering, and firewood cutting. In lieu of burning, BLM and operator may remove slash at landing areas to be used as mulch to cover roadbeds during stabilization.

Post treatment fuels surveys would be conducted and the Stereo Photo Series for Quantifying Forest Residues in the Douglas-fir Type of the Willamette National Forest (General Technical Report PNW-GTR-258, Ottmar, Hardy, Vihnanek, May 1980) or the Stereo Photo Series for Quantifying Forest Residues in Coastal Oregon Forests (General Technical Report PNW-GTR-231, Ottmar, Hardy) would be used to help identify areas with increased fuel loads.

All prescribed burning would require a project level Prescribed Fire Burn Plan that adheres to smoke management and air quality standards, meets the objectives for LUAs, and maintains or restores ecosystem processes or structure. The burn plan would comply with the Northwest Oregon (NWOR) Fire Management Plan for the Eugene District BLM, Salem District BLM, Siuslaw National Forest, and the Willamette National Forest dated May 20, 2009. All burning would be coordinated with the local ODF office in accordance with the Oregon State Implementation Plan and Oregon Smoke Management Plan.

Table 5. **Fuels Treatments for Proposed Action (including site preparation)**

Harvest Type	Total Acres	Broadcast Burn Acres	Hand Pile Acres	Machine Pile Acres	Landing Piles
Commercial Thin	288	0	0	20	105
Low Density Thin	3	0	3	0	0
Regeneration	79	79	0	0	0
R/W	3	0	0	0	0
Totals	**371**	**79**	**3**	**20**	**105**

Reforestation

Regeneration harvest units would be planted with native conifer seedlings during the first planting season after site preparation. Seedlings would be grown from seed collected from parent trees adapted to the seed zone and elevation band of the site. Species planted would be primarily Douglas fir and western red cedar with a minor component of other species indigenous to the site. Retained western hemlock trees would be expected to provide natural seeding for that species. Approximately 440 seedlings per acre would be planted, generally on a 10x10 feet spacing. Additional long term stand maintenance would be done according to BLM's normal silvicultural practices.

Table 6. **Road Work, Miles**

Fawn Two area									
Road ID	BLM Land, road work in miles					Private/ USFS/State Land, miles			Associated Unit
	New Construction Natural Surface	New Construction May Rock	Renovate existing road	Maintain existing road	Decommission or stabilize/close	Maintenance	New construction, decommission	Renovate existing road	
P-1		0.16			0.16				25A
P-2		0.09			0.09				25A
8-4E-31.0				2.27					25A, 25B
8-3E-25.0				0.12					25A
8-3E-25.4				0.54					25B
Totals	**0**	**0.25**	**0**	**2.93**	**0.25**	**0**	**0**	**0**	
Outer Limits area									
Road ID	BLM Land, road work in miles					Private/ USFS/State Land, miles			Associated Unit
	New Construction Natural Surface	New Construction May Rock	Renovate existing road	Maintain existing road	Decommission or stabilize/close	Maintenance	New construction, decommission	Renovate existing road	
OTL Q spur						0.26			29A,B,C,F
10-4E-28.2			0.96					1.14	All 29,
10-4E-28.3			0.60						29C-E
10-4E-17.1			0.27						17A
P-1	0.12				0.12		0.06		17A
P-2	0.13				0.13				17A
10-4E-18				0.21		0.75			17B
10-4E-18.1			0.19	0.48		0.28			17A

Outer Limits area (continued)									
Road ID	BLM Land, road work in miles					Private/ USFS/State Land, miles			Associated Unit
	New Construction Natural Surface	New Construction May Rock	Renovate existing road	Maintain existing road	Decommission or stabilize/close	Maintenance	New construction, decommission	Renovate existing road	
Halfway Cabin						1.45			All 29
South Rock Crk						4.45			All 29
North Rock Crk						4.65			17A,B, All 29
NRC 800						1.25			17A,B, All 29
Monument Peak						6.84			17A,B, All 29
USFS road Sec. 28						2.00			All 29
Totals	**0.25**	**0**	**2.02**	**0.69**	**0.25**	**21.93**	**0.06**	**1.14**	

Hauling and Haul Routes

BLM has identified haul routes serving different portions of the project area. These are a combination of BLM, private and ODF and shown in Table 6 and on the maps in EA Section 1.2.

In the Fawn Two area: The Fawn Creek road (8-4E-34) will be the main haul route to the paved North Fork County Road.

In the Outer Limits area: The Monument Peak Road (10-3E-2) will be the main haul route to the paved Rock Creek County Road. For winter haul, additional sediment control measures (sediment traps, erosion fencing or straw bales, and relocation of ditch turn-outs) would be installed at three stream crossings during the dry season (*see PDF #38, EA Section 3.3.3.2*).

Additional haul for the Outer Limits area includes the Monument Peak road to the North Rock Creek Road (10-4-28.2 in Section 29) to the paved North Fork County Road.

See Table 18 EA Section 3.3.3.1 for details of road numbers and distances to listed fish habitat.

Project Design Features

This section summarizes the project design features (PDFs) that would further reduce the project's effects on the affected resources described in EA Chapter 3. PDFs described in this section would be implemented in the Outer Limits/Fawn Two timber harvest project.

The IDT of resource specialists developed this set of site-specific PDFs to serve as the Best Management Practices (BMPs) for this project. The IDT selected or created these design features to implement management actions/direction and the principles of the design features and BMPs described in the RMP/FEIS (*pp. 2-35 – 2-37, 4-11 – 4-14, G-1 – G-2, S-1 – S2*) and RMP (*pp. 23-24, C-1 – C-2*). The IDT selected this set of PDFs based on its combined experience, training, professional judgment, field analysis of this project area and familiarity with ongoing published research.

BLM would incorporate these design features into the project layout, contract requirements, and contract administration to ensure that the project is implemented as analyzed in this EA and that the risk of effects to the resources are no greater than those described in EA Chapter 3. BLM would require the operator to implement each of the following PDFs, unless otherwise stated.

The following PDFs would:

- Protect special status species (Vegetation); soil productivity (Soil); water quality and quantity (Water); fisheries, listed fish and aquatic habitat (Fish); stand structure, habitat and species (Wildlife); air quality (Fire/Air); public safety, rural interface and recreation (Public); cultural resources (Cultural).
- Prevent or reduce: spread of invasive/non-native plant species populations (Invasives), fire hazards and risks (Fire/ Air)
- Achieve: Desired forest stand composition (Vegetation); Economic Efficiency (Economic), fuel reduction (Fire/Air)

Table 7. **Project Design Features (PDFs)**

PDFs (RMP/FEIS references for key points)	Applicable Resources / Objectives									
	Vegetation	Soil	Water	Fish	Wildlife	Invasives	Fire /Air	Public	Cultural	Economic
In Unit Layout and All Logging Operations: RMP/FEIS (pp. 2-34 -- 2-37; 4-11 -- 4-13; G-1,2)										
1. Limit the area compacted (>20 percent increase in soil bulk density) by logging operations to less than ten percent of the harvest area in each unit, outside of road rights-of-way.	♦	♦	♦	♦	♦	♦		♦		♦
2. Locate skid trails and skyline corridors to avoid concentrating runoff water flows that could cause rill or gully erosion with potential to displace soil more than a few feet.	♦	♦	♦	♦						
3. Lift the leading end of all logs off of the ground during yarding (one-end suspension) to prevent the blunt ends of logs from displacing soil in order to prevent creating a channel for erosion. Applies to both skidding and skyline yarding inhaul, but may not be feasible for winching and lateral yarding.	♦	♦	♦	♦						
4. Limit ground-based and cable logging landing size to the minimum area needed for safe and efficient operations. Size varies with terrain, equipment size and log size and usually averages less than 60 feet by 80 feet (approximately 0.1 acre) located on and adjacent to roads.	♦	♦	♦		♦	♦	♦			♦
5. Helicopter logging landings in areas already cleared of vegetation (such as large road turnouts, junctions, or rock pits) would be emphasized for helicopter landing and service use. Limit size to the minimum area needed for safe and efficient operations.										
6. Limit number of landings to the minimum number needed for safe and efficient operations. Number of landings needed varies with terrain, equipment, log size and road access.	♦	♦	♦		♦	♦	♦			♦
7. Allow equipment with tracked carriages designed for forestry/logging use (such as commonly used for cut-to-length (CTL) processors, piling or shovel swing) to operate between designated skid trails when the following conditions are met: • Slopes are ≤45 percent. • The operator follows a BLM approved plan to prevent more than light soil compaction and displacement based on soil conditions at the time of operation. • Potential techniques include: single round-trip equipment travel in any place; creating a slash mat in front of the tracks prior to travel; minimal turning; dry soils; low ground pressure tracks; etc.	♦	♦	♦	♦						♦
8. Generally limit landing equipment operations to the road prism or other approved portion of the landing designed and constructed for equipment operating area. Vegetation may be cleared, logs may be stacked, cables may be attached, anchors may be placed or installed, and equipment pads (i.e. yarder, processor) may be constructed outside of the equipment operation area when approved by the BLM.	♦	♦	♦		♦	♦	♦			♦

PDFs (RMP/FEIS references for key points)	Applicable Resources / Objectives									
	Vegetation	Soil	Water	Fish	Wildlife	Invasives	Fire /Air	Public	Cultural	Economic
9. In thinning units, retain organic material including duff, litter and logging slash on the forest floor in average amounts not less than are present in the stand prior to management operations to provide soil stability and nutrient cycling.	♦	♦	♦	♦	♦	♦	♦			
10. Implement erosion control measures where BLM management operations have exposed or disturbed soil to prevent rill or gully erosion that would displace soil more than a short distance (several feet). Typical measures include: shaping to modify drainage (water bars, sloping, etc.); tilling; placing logging slash and debris on exposed soil; and seeding with native species.	♦	♦	♦	♦	♦	♦				
11. Prevent unauthorized OHV use through security measures during operations and physically blocking access and/or making potential routes impassible after operations. Road and skid trail closure methods would be designed to avoid causing erosion, to avoid damaging retained trees and to allow closed roads to be opened if needed for firefighting.	♦	♦	♦	♦	♦	♦	♦	♦		
12. Locate unit boundaries to provide Stream Protection Zones (SPZ) within the Riparian Reserve along both sides of all identified streams (SPZ widths are slope distance): SPZ are minimum 60-85 feet wide (dependent on tree height and hill slope, Salem District revised guidance 10/08/2010) on each side of perennial streams and 30 feet on intermittent streams.	♦		♦	♦	♦					
13. Directionally fall trees[19] in the harvest units so that they generally do not enter the SPZ or adjacent untreated stands.	♦		♦	♦	♦					
14. When additional trees are identified for cutting to facilitate safe logging operations (hazard trees, skid trails and yarding corridors, attaching cables, etc.), BLM would designate which trees are to be removed and sold and which trees are to be retained in place as woody debris (including CWD) according to the LUA objectives for each unit. In thinning units, such trees larger than 36 inches dbh would be retained in place as CWD.	♦				♦					♦
In Ground-based Logging Operations: RMP/FEIS (pp. 2-34 through 2-37; 4-11 through 4-13; G-2)										
15. Limit the area of skid trails (pathways created by dragging logs to a landing - FEIS 6-14) plus the portion of landings which are outside of road rights-of-way to ten percent of the surface area of harvest units. (RMP C-2)	♦	♦	♦	♦		♦				♦
16. Limit the width of skid trails to 12 feet. (IDT, standard BLM timber sale contract provision.)	♦	♦	♦	♦		♦				♦

[19] Directional felling means to cut trees so that they fall in a specific, desired direction to achieve objectives such as: to avoid impacts to the SPZ, roads, adjacent stands or private property; reduce fuel accumulation next to roads or property lines; and protect retained trees. Directional felling is also used to increase efficiency of operations and worker safety by orienting felled trees within a logging unit to facilitate yarding and prevent trees from rolling/sliding onto workers.

PDFs (RMP/FEIS references for key points)	Applicable Resources / Objectives									
	Vegetation	Soil	Water	Fish	Wildlife	Invasives	Fire /Air	Public	Cultural	Economic
17. Allow skidding (dragging logs behind a skidder) and other ground based logging operations during periods of low soil moisture content (RMP C-2), generally considered to be the dry season approximately June-October (IDT) (RMP/FEIS pp. 4 – 12-13).	♦	♦	♦	♦		♦				♦
18. Re-use existing skid trails whenever feasible for logging operations according to the approved logging plan.	♦	♦	♦	♦		♦				♦
19. Locate new skid trails generally on slopes not greater than 35 percent (RMP, p. C-2; RMP/FEIS, p. 2—35) to avoid gouging, soil displacement, and erosion with effects exceeding those analyzed in the RMP/FEIS.	♦	♦	♦	♦		♦				♦
20. Generally limit uphill skidding to slopes where skidders would not break traction to avoid soil displacement.[20]	♦	♦	♦	♦						♦
In Skyline[21], Other Cable Yarding[22] and Helicopter yarding Operations: RMP/FEIS (pp. 2-34 through 2-37; 4-11 through 4-13; G-1,2)										
21. Design the skyline yarding layout so that corridors average at least 150 feet apart on at least one end of the corridors and to laterally yard logs to the skyline to limit the ground area impacted by yarding corridors.	♦	♦	♦	♦						♦
22. For lateral yarding operations fall trees to orient logs so that they cause the least soil disturbance and damage to retained trees during lateral yarding.	♦	♦	♦	♦	♦					♦
23. Landings for Helicopter use would remain outside any BLM Riparian Reserve area, and be approximately 1-3 acres in size. Helicopter logging landings in areas already cleared of vegetation (such as large road turnouts, junctions, or rock pits) would be emphasized for helicopter landing and service use.										
24. Helicopter landings on BLM land would be decommissioned where needed. Decommissioning helicopter landings would include tilling (decompacting) of the landings where appropriate and/or covering the area with logging slash and debris to provide additional stability and blocked to prevent vehicle use. Decommissioned helicopter landings would be seeded and/or planted with native vegetation.										

[20] Traction is a highly variable combination of the power required to skid logs, equipment characteristics and soil strength. The potential to break traction increases as slope steepness increases. BLM field experience confirms that 20 percent slope consistently provides for adequate traction when skidding uphill while steeper slopes require additional site-specific evaluation.

[21] In skyline yarding operations, a cable is suspended above the ground (a line in the sky) which holds a carriage that uses another cable to pull logs sideways across the slope to the skyline (lateral yarding). A yarder (machinery with a tower, cables and winches) located on the landing then pulls the carriage up the skyline and pulls (yards) logs up to the landing. The leading end of the log is typically lifted off the ground while being moved (one end suspension). In some situations the entire log is lifted off the ground while being moved toward the landing (full suspension).

[22] "Other Cable Yarding" includes a variety of equipment which pulls logs to a landing or skid trail with cables, but may not use a skyline. Some common systems include a "Yoder" (**Y**arder L**o**a**der**), a "tong tosser", or simply winching to a skidder.

PDFs (RMP/FEIS references for key points)	Applicable Resources / Objectives									
	Vegetation	Soil	Water	Fish	Wildlife	Invasives	Fire /Air	Public	Cultural	Economic
In Other Operations: RMP/FEIS (pp. 2-34 -- 2-37; 4-8 -- 4-13; G-1,2)										
25. Hazardous fuels surveys would be conducted and site specific plans for hazard fuels reduction treatments would be implemented by the Authorized Officer following harvest operations.	♦						♦	♦		♦
26. A Prescribed Fire Burn Plan would be initiated and signed by the Authorized Officer prior to any prescribed burning activity.	♦	♦					♦	♦		♦
27. Burning would be conducted in accordance with the Salem District RMP, Oregon State Implementation Plan and Oregon Smoke Management Plan as administered by ODF and would comply with the provisions of the Clean Air Act. It would be conducted under good atmospheric mixing conditions to lessen the impact on air quality in Smoke Sensitive Receptor Areas.	♦	♦				♦	♦	♦		♦
28. Prescribed burning may include broadcast burning, landing pile or machine pile burning, swamper burning, or handpile construction and burning and may be used individually or in combination in areas where fuel loading is heavy or the fire risk is determined to be high.	♦	♦	♦	♦	♦	♦	♦			♦
29. When hand, machine, or landing piles are identified by the Authorized Officer as the specified fuels treatment the following requirements would apply: • Piles would be located as far as possible from large snags, green trees, and other reserved trees to minimize damage. • Large woody debris greater than eight inches in diameter would be retained on site as much as feasible and not piled (RMP C-7). • As feasible, piles would not be constructed on top of stumps or CWD. • Piles would be covered with 4 mil (.004 inch thick) black polyethylene plastic. The plastic shall adequately cover the pile to ensure ignition and would be placed and anchored to help facilitate the consumption of fuels during the high moisture fall/winter burning periods. • In skyline yarding and helicopter landing areas: o Machine and landing piles would only be constructed within 25 feet of designated roads and landings. o Equipment used in the construction of machine and landing piles would remain on the roads or landings during the construction. • In ground based yarding areas: o A track mounted hydraulic excavator shall be used to pile woody debris. o The excavator shall be equipped with a hydraulic thumb or a rotating controllable grapple head. The machine shall have a minimum reach of twenty-five (25) feet. o Operating techniques would be designed to prevent gouging, soil compaction and displacement, and erosion. o Away from roads, the excavator shall be required to work on a slash mat in order to reduce compaction.	♦	♦	♦				♦			♦

PDFs (RMP/FEIS references for key points)	Applicable Resources / Objectives									
	Vegetation	Soil	Water	Fish	Wildlife	Invasives	Fire /Air	Public	Cultural	Economic
○ Machine operations would be limited on bare soils to dry conditions with less than 25 percent soil moisture content in the upper six inches of soil. (RMP C-7) ○ Soil compaction would be limited outside of skid trails and landings to no more than two percent of the surface area of the unit – the amount of compaction analyzed for tractor-constructed fire trails. (RMP C-9) ○ Machine piles would not be constructed within 25 feet of property lines, or on slopes greater than 35 percent.										
30. Lopping and scattering of fuels would be incorporated where fuel loading is relatively heavy but not heavy enough to warrant burning.	♦						♦	♦		♦
31. Pullback of fuels would be incorporated where fuel loading is relatively light (especially along roads and property lines) but not heavy enough to warrant burning.	♦						♦	♦		
32. Oregon Occupational Safety and Health Administration (OSHA) and BLM would require the operator to place signs, temporarily block roads with vehicles or moveable barricades, and/or use flaggers to ensure public safety during active logging, hauling, and fuel treatment operations.	♦						♦	♦		
33. Retained green trees shall be protected as feasible to prevent more than four trees per acre mortality from prescribed fire. Techniques such as lighting patterns to minimize heat delivered to tree crowns by the convection column, pre-wetting around retained trees and snags, and/or fire trails around aggregated retention areas shall be used to reduce mortality.	♦				♦		♦			♦
Road Use, Construction, Renovation, Maintenance, Stabilization and Closure: RMP/FEIS (pp. 2-22,68,69; 2-75,76; 4-11 -- 4-19; G-2 -- G-7)										
34. Locate, design and construct roads wherever feasible to drain surface water to adjacent slopes where it would infiltrate into the soil and groundwater; and to avoid collecting water (in ditches and on road surfaces) where it could be channeled directly to streams (*Wemple et al. 1996*).		♦	♦	♦						
35. Locate, design and construct roads in upland areas on stable ground with side slopes generally less than 30 percent that do not require extensive cut-and-fill construction methods, in order to avoid increasing mass failure (landslide) potential and to avoid intercepting groundwater.		♦	♦	♦						♦
36. Conduct all in-stream activities (e.g. culvert removal and/or installation) during the designated In-Water Work Period. If water is flowing, divert (pipe or pump) water around the work site.			♦	♦						
37. Install sediment traps and/or filters in ditches that drain to stream crossings to prevent sediment transport that would cause a visible increase in turbidity from entering streams wherever it is not feasible to drain water from roads directly onto adjacent slopes. Typical methods include: maintain vegetation in the ditch; create small settling basins; or install artificial filters such as straw bales or wattles.			♦	♦						♦

PDFs (RMP/FEIS references for key points)	Applicable Resources / Objectives									
	Vegetation	Soil	Water	Fish	Wildlife	Invasives	Fire /Air	Public	Cultural	Economic
38. For winter haul on the Monument Peak Road (10-3E-2) Install sediment traps/and or filters in the ditches that drain to stream crossings and prevent sediment transport from 1st order tributaries leading into Little Rock Creek. These three crossings are located in the SE ¼ of Section 2 (T.10S, R.3E) (*see EA 3.3.3.2*). These methods should include but are not limited to: • Install straw bales or wattles the ditch line on the west side of the road at the downstream-most crossing; • Install a line of straw bales or erosion fencing on the inside curve at the middle crossing to carry runoff and sediment into a vegetated area downslope of the stream crossing; and install a series of straw bale sediment traps in the west ditch at the middle crossing to prevent sediment delivery from the ditch (450 ft. long) to the stream crossing; • Install a continuous line of straw bales or erosion fencing on the inside curve (east side) of the upstream-most crossing to carry runoff and sediment past the stream and turn it out into a vegetated area downslope of the crossing.										
39. Haul logs on forest roads only during times and road conditions that would not generate sediment that would enter streams and cause a visible increase in stream turbidity			♦	♦						♦
40. BLM authorized personnel would visually monitor turbidity (a visible reduction in water clarity)[23] caused by road-generated sediment entering the stream at stream crossings on the haul route to ensure ongoing compliance with ODEQ water quality standards of no visible (less than ten percent) increase in turbidity.			♦	♦						♦
41. BLM authorized personnel would check for turbidity beyond the mixing zone downstream (about 100 meters) if turbidity is visible in the stream at the crossing. If water clarity is visibly altered beyond the mixing zone, BLM would suspend hauling and other operations immediately and implement site specific measures to reduce fine sediment runoff into the stream. Allow operations to resume when weather and road conditions, combined with measures taken to reduce sediment transport to streams are deemed sufficient to comply with State of Oregon turbidity standards.			♦	♦						♦
42. If road-generated sediment transport to streams and the resulting turbidity does not comply with ODEQ water quality standards during the wet season, BLM would not allow log hauling from this project in order to prevent adding to cumulative effects of sediment and turbidity.			♦	♦						

[23] Turbidity is a measurement of water clarity and is not convertible into a volume measurement of sediment yield unless correlated to suspended sediment data. "A visible increase in turbidity" has been found in field experience to correspond closely to Oregon DEQ standards for turbidity.

PDFs (RMP/FEIS references for key points)	Applicable Resources / Objectives									
	Vegetation	Soil	Water	Fish	Wildlife	Invasives	Fire /Air	Public	Cultural	Economic
43. Decommission all newly constructed non –rocked, natural surface roads and close and stabilize all newly constructed rocked roads after use to reduce changes to natural drainage patterns, prevent erosion, and prevent unauthorized use by motor vehicles (including OHV).	♦	♦	♦	♦	♦	♦	♦	♦		♦
44. To decommission roads apply a site-specific combination of techniques such as: use water bars or other surface shaping to drain runoff water to vegetated slopes; sediment traps; surface tilling; seeding with native species; mulching, covering roadbeds with logging slash and debris; and/or other techniques to promote infiltration, to prevent erosion and sediment transport to streams that would cause a visible increase in turbidity, and to prevent increases in peak flows. Use barricades, debris or roughening to make these roads impassable for motor vehicles.	♦	♦	♦	♦	♦	♦	♦	♦		♦
45. To close and stabilize roads: road subgrade would be water-barred where appropriate, seeded and closed to vehicle traffic.	♦	♦	♦	♦	♦	♦	♦	♦		♦
46. Culverts and subgrades of closed and stabilized roads would be left intact so that the road can be renovated for future use or fire control with minimal disturbance and expense.	♦						♦	♦		♦
47. When natural surface roads would be kept intact over winter for use on this project the next year, use one or more of the following methods to prevent erosion and sediment transport to streams that would cause a visible increase in turbidity: matting, mulching, constructing water bars or other surface shaping to drain runoff water to vegetated slopes, seeding, sediment traps and blocking the entrance to prevent unauthorized motor vehicle use.		♦	♦	♦				♦		♦
48. Restrict road construction, renovation, maintenance and decommissioning operations to times, weather conditions and soil conditions when the subgrade would not be damaged by operations and no sediment laden runoff would be generated.		♦	♦	♦						♦
49. Seed and mulch all disturbed soil at stream crossings with native species seed approved by BLM and sterile mulch (free of non-native seed). Place rock, logs or woody debris as necessary to stabilize disturbed soil.	♦	♦	♦	♦	♦	♦				
50. Provide appropriate traffic control and other protection measures as needed to provide for public safety. Potential measures include signs, flaggers or temporary barricades and provide for traffic to pass through within an appropriate time.								♦		♦
Specific to Regeneration Harvest for Units 17A, 25A & 25B: RMP (pp. 21, 25, 26-27, D-2): Management Recommendations for the Oregon Red Tree Vole, September 27, 2000.										
51. Retain 15-22 green trees per acre (average, both aggregated and dispersed) for recruiting snags and CWD and developing a large green tree component.	♦				♦		♦			♦

PDFs (RMP/FEIS references for key points)	Applicable Resources / Objectives									
	Vegetation	Soil	Water	Fish	Wildlife	Invasives	Fire /Air	Public	Cultural	Economic
52. Retain and protect large remnant trees (older than 200 years) and early decay class snags over 15 inches DBH and 15 feet tall. Methods for retention can include but are not limited to: excluding them from harvest units ("tagging out" pockets of remnant trees), marking individual trees or snags for retention, locating yarding corridors, and designing site preparation practices to avoid cutting or damaging identified trees and snags.					♦		♦			♦
53. Retained green trees shall be protected as feasible to prevent more than four trees per acre mortality from prescribed fire. Techniques such as lighting patterns to minimize heat delivered to tree crowns by the convection column, pre-wetting around retained trees and snags, and/or fire trails around aggregated retention areas shall be used to reduce mortality.	♦				♦		♦			♦
54. Create up to 2 snags per acre by base girdling or topping after treatment to increase snag and CWD habitat in the future stand.					♦		♦			♦
55. Conduct post-harvest monitoring of CWD. If CWD requirements are not met (NWFP), fall up to two trees per acre to create CWD.					♦		♦			♦
56. No habitat modifying operations (falling, yarding, road construction, prescribed burning) would be allowed within disturbance range (0.25 miles) of known northern spotted owl (NSO) sites during the nesting season, or on unit 17A (March 1 – July 15) unless appropriate NSO surveys indicate that there are no nesting spotted owls within the disturbance range.					♦		♦			♦
57. Seasonally restrict habitat modifying activities affecting migratory birds April 15-July 31 to reduce potential for unintentional take of migratory birds, their nests, eggs and nestlings.					♦		♦			♦
58. Reforest regeneration harvest units by planting conifer seedlings.	♦	♦			♦	♦	♦			
59. To prepare site for reforestation in ground-based regeneration harvest units, appropriate methods will be utilized to reduce compaction where deemed feasible and necessary.	♦	♦								
60. When additional trees are identified for cutting to facilitate safe logging operations (hazard trees etc.) any orange-marked reserve tree in regeneration harvest units would remain on site.	♦	♦					♦			♦
Stand Structure, Wildlife Habitat and other Vegetation, all action alternatives: RMP/FEIS (pp. 2-17,21,22,26,32-33,37-38,59-62,80-92; 4-11 through 4-13; G-1,2; K-1--3)										
61. No habitat modifying operations (falling, yarding, road construction, prescribed burning) would be allowed within disturbance range (0.25 miles) of known northern spotted owl (NSO) sites during the nesting season, or on unit 17A and 17B (March 1 – July 15) unless appropriate NSO surveys indicate that there are no nesting spotted owls within the disturbance range.					♦		♦			♦
62. Seasonally restrict habitat modifying activities affecting a known raptor site in all units 29C and 29D in the Outer Limits area to March 01- July 31, to reduce disturbance during nesting season. May be waived if Raptors are not present.					♦		♦			♦

PDFs (RMP/FEIS references for key points)	Applicable Resources / Objectives									
	Vegetation	Soil	Water	Fish	Wildlife	Invasives	Fire /Air	Public	Cultural	Economic
63. Retain large remnant trees and generally protect them from logging damage. Individually designate such trees that are found inside unit boundaries for retention.	♦									♦
64. Retain snags larger than 15 inches diameter and taller than 15 feet intact and standing during logging and site preparation activities as much as feasible.[24]					♦					♦
65. Retain existing CWD meeting RMP standards of at least 20 inches diameter (large end) and 20 feet long wherever feasible and protect them from logging damage. Design skid trail location and operating techniques that require minimal movement of CWD to protect its physical integrity. (*RMP p. 21*)		♦			♦					♦
66. Retain all merchantable hardwood species (over 7 inches in diameter); these trees do not count toward the green tree retention requirement. Some hardwoods may be cut and left on site to facilitate logging along roadsides or other areas.	♦				♦					♦
67. Plan road and landing locations to avoid impacts to snags larger than 15 inches diameter and taller than 15 feet whenever BLM determines it is safe and feasible to do so.					♦			♦		♦
68. Plan road and landing locations to avoid impacts to large remnant trees and snags whenever BLM determines it is safe and feasible to do so.	♦				♦					♦
69. Retain the following categories of green trees to meet objectives described in EA section 2.3.1.	♦				♦					♦
70. Retain trees which have been identified as part of Salem's tree improvement program.	♦				♦					♦
71. As feasible, in thinning and regeneration areas retain trees that have desirable characteristics for wildlife habitat (e.g. asymmetrical crowns with multiple or broken tops, large limbs, dead areas being used by cavity excavators, deep crevices and cavities).	♦				♦					
72. Avoid incidental unapproved damage[25] to more than two retained trees per acre using techniques such as: requiring extra precautions to prevent damage when falling and yarding during the spring growing season when bark is easily damaged (typically March through June); directional falling to lead with skid trail or skyline corridor alignment; lateral yarding to skylines; using selected "cut" trees as rub trees in locations where logs "turn a corner" during logging; or using protective bumpers on retained trees used as rub trees. Trees identified in the logging plan to be used to facilitate logging (e.g. lift or tail trees, intermediate supports, guy line anchors, rub trees, cribbing, etc.) may be in addition to the two per acre.	♦				♦					♦

[24] Some snags would be cut to provide for safe operations as required by Oregon Occupational Safety and Health Division (OR-OSHA, Oregon Occupational Safety and Health Standards, OAR Chapter 437, Division 7, Forest Activities).
[25] The standard for "damage" is bark damage on more than 50 percent of the tree's circumference.

PDFs (RMP/FEIS references for key points)	Applicable Resources / Objectives									
	Vegetation	Soil	Water	Fish	Wildlife	Invasives	Fire /Air	Public	Cultural	Economic
73. Retain trees in thinning units which have been girdled, topped, damaged or felled to facilitate logging (up to 2 per acre each of standing and felled) in project units to provide snags and CWD, when retaining those trees is consistent with safe and efficient logging practices.	♦				♦					♦
74. Low density thinning (LDT) areas associated with thinning units in Matrix would be located to provide small areas (up to approximately one to three acres each) of early seral habitat with approximately 15-18 trees per acre retained. LDT areas in Riparian Reserve would be limited to areas where special habitats can be enhanced or species diversity increased. Locations would be determined by BLM based on site examinations. LDT areas would generally be circular.	♦				♦					♦
75. Seed and mulch exposed soil using approved native plant species seed (such as Oregon certified blue wild rye (*Elymus glaucus*)) and sterile mulch, in order to stabilize the soil and prevent establishing invasive/non-native plant species on disturbed soil in the project area.	♦	♦	♦	♦	♦	♦				
76. Within LDT area: seed with forage species and/or plant with shrubs or tree seedlings as needed based on field surveys by BLM resource specialists.	♦	♦			♦	♦	♦			
77. Within LDT area: pile and burn logging slash and debris as needed to provide access by big game species. Retain up to ten percent of the piles for habitat features.	♦	♦			♦		♦			
78. Clean all ground-disturbing logging and road construction equipment, and the vehicles used to transport this equipment to the project area, to be free of off-site soil, plant parts and seed prior to entering the project area to prevent introducing invasive and non-native plants into the project area.	♦					♦				
79. Restrict or suspend operations, or modify project boundaries at any time if plant or animal populations that require protection are found during ongoing surveys or are found incidental to operations or other activity in the project area.	♦				♦					
80. Protect known locations of red tree voles by retaining a habitat area ≥10 acres with at least one site potential tree height between the nest tree and the habitat area boundary.	♦				♦		♦			♦
81. Protect know location of Cascade axetail slug in unit 17A with a 1 acre skip	♦				♦		♦			♦
82. Implement ¼ acre skips in Unit 17B in the Outer Limits area to retain advanced western hemlock regeneration where feasible.										
Cultural Resource Protection:										
83. Restrict or suspend ground disturbing activities immediately if prehistoric cultural resources are encountered during project implementation. Conduct a professional evaluation of the resource site and develop appropriate management practices to protect the site/cultural values.									♦	

Seasonal Restrictions and Operational Periods

The Seasonal Restrictions, Modifications and Operating Periods are summarized in Table 8

Table 8. **Summary of Seasonal Restrictions and Operational Periods**

Seasonal Restriction	Reason	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Any habitat modifying activities in units 17 A and B and, March 1-July15.*	Minimize disturbance during spotted owl breeding and nesting season												
Any logging and road building activities in units 29C and D, March 1-July 31.*	Minimize disturbance during Raptor breeding and nesting season												
Any habitat modifying activities in Units 17A and 25A and B**	Minimize disturbance during migratory bird breeding and nesting season												
Hauling, based on conditions	Water quality and sedimentation, protect fish												
Skidding operations	Soil protection, site productivity, water quality												
Other ground-based logging operations	Soil protection												
Road Construction / Decommissioning/ Stabilizing / Haul on Natural Surface Roads	Erosion control, road damage												
In-water work: stream culvert maintenance	Protect fish and aquatic habitat												
Logging operations	Fire season, ODF regulated use												

KEY			
	White: Operations typically do not require additional PDF to protect resources.	Gray: Operations may be prohibited (restricted) or require additional PDF to protect resources, or allowed as planned depending on conditions.*	Black: Operations are often prohibited (restricted). If allowed, are typically modified by added PDF to protect resources.

*May be waived if no Owls or Raptors are found after surveys

** This restriction is specific to **regeneration harvest** activities only**.**

Timber Sale Contract Administration

The standard BLM timber sale contract would require the operator to submit a written operations plan which: identifies personnel doing the work; identifies the equipment to be used for operations, and describes how the personnel propose to use the equipment to accomplish the work in compliance with contract provisions and in accordance with the project design analyzed in this EA. Once approved by the BLM, this operations plan would become an enforceable part of the timber sale contract.

Performance would be monitored by authorized BLM personnel according to BLM regulations and contract administration procedures where Authorized Officers inspect for contract compliance, generally at least once each week during contract operations. The Contracting

Officer enforces compliance with the contract and would suspend operations if the operator fails to perform the required preventive and restorative practices analyzed in this EA. BLM timber sale contract requires bonding in an amount sufficient for BLM to complete mitigation and restoration work if the operator fails to perform the preventive and restorative requirements of the contract.

2.3.2 Alternative Action

In the Matrix (CONN):

BLM proposes to thin approximately 368 acres of 76-134 year old forest stands within the CONN portion of the Matrix LUA. For Matrix objectives, refer to EA Section 1.4. The proposed thinning will reduce stand density by implementing a "thin from below" prescription in all the units in the Outer Limits area and a "proportional thin"[26] prescription in the Fawn Two area, where a variety of size classes of trees are retained, as well as clumps of trees and gaps with no trees, are created in other units (*see EA Table 2*). Approximately 3 acres will be cleared of vegetation for new road construction (*see EA Table 3, 4*).

For the Outer Limits area to be *thinned from below*, the prescription proposal is the same as described in the Proposed Action (*see EA Section 2.3.1*). The unit proposed for regeneration harvest in the Proposed Action (16 acres of unit 17A) would be also thinned with a *thin from below* prescription under this alternative (*see Table EA 15*).

For the Fawn Two area proposed for a *proportional thinning*, the prescription proposes to:

- Retain 10-15 one-acre clumps within the Fawn Two harvest units. There would be approximately one acre of unthinned clump for every 5 acres of thinned area.
- The thinned areas would be proportionally thinned, retained trees include;
    - The largest trees in the stand; emphasize marking any trees over 36 inches in diameter. Retain large remnant trees and generally protect them from logging damage. Individually designate such trees that are found inside unit boundaries for retention.
    - Green trees across most of the diameter classes within the stands;
    - Any western red cedar 7 inches or larger at DBH where present;
    - Maintain an average canopy closure of 45-50 percent over the thinned portion and unthinned "clumps" within the tagged unit boundaries.
- Retain large (over 15 inches diameter and over 15 feet tall) snags in the harvest area and protect them from damage as much as feasible during timber harvest activities
- Retain large (over 20 inches diameter and 20 feet long) down logs in the harvest area and protect them from damage as much as feasible during timber harvest activities.
- Retain all merchantable hardwood species (over 7 inches in diameter); these trees do not count toward the green tree retention requirement. Some hardwoods may be cut and left on site to facilitate logging along roadsides or other areas.
- Retain trees which have been identified as part of Salem's tree improvement program.

[26] In this document, a "proportional thin" prescription is where a variety of size classes of trees are retained, as well as clumps of trees are left in some areas and gaps with no trees are created in other areas throughout each unit. The intention of a proportional thin prescription is not only to make light, water and nutrients available for remaining trees, but to provide species and structural diversity, habitat for terrestrial species and/or enhance existing special habitats.

- Reforest openings where needed with conifers seedlings, anywhere from 220 to 440 trees per acre.
- An average of 45 trees per acre will be left with both clumps and thinned areas combined, leaving an average RD of 30.

Connected Actions

All connected actions are identical to the Proposed Action.

Landings

All proposed landing descriptions are identical to the Proposed Action.

Fuels Treatments

Post-treatment fuels surveys would be conducted in the commercial thinning harvest units and a site and condition specific burn plan prepared. If the fuels surveys indicate that another treatment such as hand pile/burn or lop and scatter would be more appropriate on some or all acres the treatment recommendation would be changed accordingly. Alternative treatments that are less impacting than burning may be substituted without additional effects analysis.

Table 9. **Fuels Treatments for Alternative Action**

Harvest Type	Total Acres	Broadcast Burn Acres	Hand Pile Acres	Machine Pile Acres	Landing Piles
Commercial Thin	365	0	0	20	105
Low Density Thin	3	0	3	0	0
R/W	3	0	0	0	0
Totals	**371**	**0**	**22**	**129**	**105**

PDFs and Seasonal Restrictions

PDFs and seasonal restrictions described for the Proposed Action would be implemented with the Alternative Action, except those PDFs that are related only to regeneration harvest (*PDF #'s 51-60*).

2.3.3 No Action Alternative

The No Action Alternative describes the baseline against which the effects of the Proposed Action can be compared, i.e. the existing conditions in the project area and the continuing trends in those conditions if BLM does not implement the proposed project. The No Action Alternative means that no timber management actions, or connected actions, would occur at this time. Selection of the No Action Alternative would not constitute a decision to change the LUAs of these lands; it would also not set a precedent for consideration of future action proposals.

The No Action Alternative may be selected for individual units, portions of units, or any connected actions, as well as for the entire project area.

Only normal administrative activities and other uses (e.g. road use, programmed road maintenance, harvest of special forest products on public land) would continue on BLM lands within the project area.

On private lands adjacent to the project area, forest management and related activities would continue to occur.

2.3.4 Alternatives and Projects Considered but not Analyzed in Detail

Road Decommissioning

The IDT considered a separate project to be analyzed in this EA to decommission approximately 0.59 miles of existing road in the Fawn Two project area. The IDT determined the cost; uncertain future management objectives of stands accessible from this road; and potential short-term affects to stream crossings and downstream listed fish habitat did not warrant pursuing the project at this time. The IDT dropped this project from further consideration and analysis.

Chapter 3: Affected Environment and Environmental Effects

3.1 Analysis Assumptions and Methodology

3.1.1 Analysis Assumptions

Timber management activities would occur on BLM-administered lands allocated to planned, sustainable harvest. The Salem District RMP/FEIS analyzed for both the short-term (10 years) and long-term (decades) impacts of implementing this type of timber management action. Under the RMP, this applies to Matrix/CONN lands in the proposed project area.

Timber management activities would re-use, where feasible, the transportation system of existing skid trails, landings and truck roads proposed for this project.

The Riparian Reserve LUA on BLM-administered lands would be managed for protection of watershed values such as water quality and aquatic habitat and for fish and terrestrial wildlife habitat on both a local and landscape level. Where the Riparian Reserve overlays Matrix, Riparian Reserve management direction supersedes Matrix direction.

If the Proposed Action is implemented, the regeneration harvest units would be treated for site preparation and planted with a mix of conifer species. The reforested sites would be examined annually until the planted trees are established, then periodically to determine needs for silvicultural treatments over the next two to five decades.

If the Alternative Action or Proposed Action is implemented, in Matrix stands that are thinned, BLM would evaluate the stands for potential timber harvest in approximately 10 to 20 years – either a second entry commercial thinning, or regeneration harvest.

In Riparian Reserve stands, BLM would evaluate these stands, and other stands in the watershed, approximately each decade to determine if further silvicultural treatment is needed to recruit snags and/or CWD or to meet other Riparian Reserve objectives.

Climate change may increase the duration and severity of wildfire season to an unknown extent during the project period (three to five years), but any such overall increase would not be expected to exceed the conditions used to model fire potential for this time period.

Most private industrial forest lands in these watersheds will be intensively managed with regeneration harvests scheduled on commercial economic rotations occurring at 40-60 year intervals (PRMP/FEIS 1994, p4, and BLM observations of recent trends in industrial forest management).

3.1.2 Methodology

The Forest conditions information was compiled from a variety of sources including BLM corporate data, stand exams, and field surveys by BLM personnel.

The RMP/FEIS provided general resource information for the Salem District planning area as of September 1994.

Research publications provided ongoing baseline information specific to forest vegetation and impacts of managing or not managing forest stands (see specialist reports for publications specifically relied upon in developing the Outer Limits/Fawn Two project).

GIS data, aerial photographs, satellite imagery, LIDAR data, BLM's Forest Operations Inventory (FOI) records, resource specific field surveys (*see the following EA sections for specific surveys conducted*) and field reconnaissance by BLM resource specialists were used to describe vegetation, habitat and plant and animal species on BLM-administered lands.

3.2 General Setting/Affected Environment

Historical Influences on Forest Development in the Area Watersheds

Sources: BLM Archival Records – Metzger's Atlas, Aerial photos, timber sale files and associated environmental assessments; GIS Database; Lidar data; Little North and Middle North Santiam River Watershed Analysis, Bonney 2014, Outer Limits/Fawn Two Silviculture Prescription, Mortensen et.al. 2014, Fuels treatment prescription, 2015.

Physical and Historical Setting

Fawn Two Area

The Fawn Two area is located approximately 7 miles north of Gates in Marion County, Oregon. The proposed harvest areas are about 1 mile north of the paved north fork county road, which follows the North fork of the Santiam River. Public access to this area is restricted due to a private gate at the junction of the county road and the BLM road 8-4E-31 which leads to the units. Fawn Creek is just west of the proposed harvest area and flows into the North fork of the Santiam River.

The ground in both 25A and B is considered mostly flat, with some south and southeast slopes in unit 25A. Lands to the north, south and west of BLM ownership in Sections 24 and 25 are private industrial forest lands with some recent clear cuts, young plantations and second-growth conifer stands. East of Section 25 and BLM ownership in Section 30 is ODF land, which consists of plantations and second-growth conifer stands.

There are 64 acres proposed for harvest in the Fawn Two area. They consist of two units (25A and 25B), in one section of BLM ownership (Section 25) and one acre of road construction, both part of one forest stand approximately 316 acres total. Of the 316 acres, about half this stand was commercially thinned in 1972; this includes the entire proposed unit 25A. An additional 146 acres was commercially thinned in 1982; this includes unit 25B and approximately 6 acres in the southern portion of 25A below road 8-4E-31.

The more recent timber sales in the area include the Fawn Creek timber sale (2003); west of both units 25A and B in Section 25. There are three Evan's Mountain timber sale units in Sections 24, 25 and 30 (*see Cumulative Actions*). One of the Evan's Mountain thinning units is just north of unit 25A, across the 8-3E-25.4 road.

Outer Limits Area

The Outer Limits area is located about 6 miles southeast of the city of Gates in Linn County, Oregon. The proposed harvest areas are in two BLM sections, surrounded by primarily ODF land and private industrial timber lands. The southeast corner of the BLM ownership in Section 17 is adjacent to USFS land. The Outer Limits area is considered higher in elevation (over 3200 feet above sea level). Due to the higher elevations of these proposed harvest areas, there is a component of noble fir within the stands, as well as Douglas-fir and western hemlock.

There are 307 acres proposed for harvest in the Outer Limits area. They consist of 8 units, in two sections of BLM ownership (Section 17 and 29) and 2 acres of new road construction. The BLM manages a total of 6,179 acres of ownership in the watershed (*see Existing Watershed Condition*).

There is one BLM plantation in Section 17 that was harvested in the early 1990s, and two second-growth forest stands. There are no current records of other timber sales in Sections 17 or 29, although there is evidence of timber falling and/or harvest likely occurred. Stumps, old pieces of steel cable and remnants of skid roads are evident in portions of section 17, and throughout Section 29. The current stand age in Section 29 indicate a timber harvest or fire salvage occurring in the 1930s (*see EA Section 3.3.6.1*). A snag falling contract from 1961, which included falling over 2500 snags in Section 29, suggests a wildfire may have occurred in the area.

Access to BLM ownership in this area is currently unrestricted, with no gates along the Monument Peak access road from the paved Rock Creek county road, just south of Gates. ODF is actively logging the area, with proposed thinning timber sales directly adjacent to BLM ownership in Section 29. Other ODF land surrounding BLM ownership consists of mostly second growth conifer stands, mature conifer stands, and a few plantations. Private industrial land in the area consists of young conifer plantations and second growth conifer stands.

Existing Watershed Condition

The project is within the Little North Santiam and the Middle North Santiam River 5th field watersheds. Age class distributions of the 5th field watersheds on BLM land are illustrated in Table 2 of this EA. The distribution of land ownership within these watersheds is illustrated in Table 10.

Table 10. **Land ownership in associated 5th field watersheds, acres**

Watershed	BLM	USFS	State and Local Govt.	Private-Industrial	Private- Non industrial	Total Acres*
Little North Santiam River (Fawn Two Area)	13,255	36,144	1,869	16,613	4,309	72,190
Middle North Santiam River (Outer Limits Area)	6, 179	504	22,054	16,745	11,109	56,591

*Sum of published Watershed Analysis acres with updates based on current BLM Forest Operations Inventory GIS data.

Scope of the Project Proposal

The Proposed and Alternative Actions would harvest[27]:

- 64 acres of the 13,255 of BLM acres, or 0.5 percent of BLM lands in the Little North Santiam 5th field watershed.
- 307 acres of the 6,179 of BLM acres, or 5 percent of BLM lands in the Middle North Santiam 5th field watershed.
- Within the 371 acres proposed for harvest, 76 percent of the proposed acres are in Connectivity (Matrix) and 24 percent in Riparian Reserve.

Cumulative Actions

Past actions within the two 5th field watersheds containing the project area since the NWFP and the publication of the Salem District RMP (1995):

Fawn Two Area (Little North Santiam River 5th Field Watershed)

Past and Ongoing Actions -

- Private clear-cuts adjacent to south and west side of Section 25
- BLM Timber sales:
  - Evan's Mountain Thinning Sale: Commercial thinning of 328 acres. Completed in 2015.
  - Power Mill and Power House Thinnings: Approximately 330 acres of commercial thinning. Approximately 0.39 miles of road constructed. Completed in 2015.
  - House Mountain Thinning (EA No. OR084-04-20) 521 acres of commercial thinning. Completed in 2011.
  - Fawn Creek Timber Sale: Density Management harvest of approximately 49 acres, regeneration harvest of 9 acres. Completed in 2005.
  - Sinker Swim Thinning: Commercial thinning of approximately 161 acres. Completed in 2004.

- BLM Road Decommissioning:
  - Jobs in the Woods contract to decommission existing roads in the Little North Santiam 5th field watershed. 1.44 miles were decommissioned. Completed in 1999.
  - Fawn Creek Culvert Removal and Decommissioning Contract in the Little North Santiam River 5th field watershed. 0.15 miles were decommissioned. Completed in 2004.
  - Sinker Swim Thinning: Included the decommissioning of 0.37 miles of existing road in the Little North Santiam 5th field watershed. Completed in 2004.

[27] Acreage includes proposed new road construction

Foreseeable Future Actions -

- Private: Stands that are at least 40 years old are expected to be assessed for timber harvest.
- BLM timber sales: None are currently proposed; however, any lands that may meet the guidelines for harvest with current management direction will be assessed and could be considered for analysis within the next 5 years.

Outer Limits Area (Middle North Santiam River 5th Field Watershed)

Past and Ongoing Actions -

- Ongoing commercial thinning operations, road construction and renovation on adjacent ODF lands in T10S, R4E Section 30; Previous commercial thinning operations on ODF land in T10S, R4E, Section 17, and throughout ODF ownership in this watershed.
- BLM Timber Sales:
  - Power Mill Thinning: Commercial thinning of approximately 156 acres. Sold in 2012. Implementation on-going.
  - Turnridge Timber Sale: Regeneration harvest of approximately 65 acres, and commercial thinning of approximately 100 acres. Completed in 2004.
  - Thamnophis Timber Sale: Regeneration harvest of approximately 25 acres. Completed in 1998.
  - Roland Minto Timber Sale: Regeneration harvest of approximately 38 acres. Completed in 1998.

Foreseeable Future Actions -

- Private: Stands that are at least 40 years old are expected to be assessed for timber harvest.
- ODF timber sales: Continued thinning of adjacent timbered stands in the Outer Limits area is expected for the next 2-3 years. Additional proposals for harvest and implementation on ODF land adjacent to BLM is expected throughout the next decade.
- BLM timber sales: None are currently proposed; however, any lands that may meet current management direction for timber harvest will be assessed and could be considered for analysis within the next 5 years.

3.3 Resource Specific Affected Environment and Environmental Effects

This section of the EA describes the current condition and trend of the affected resources and the environmental effects of the alternatives on those resources. The IDT of resource specialists reviewed the elements of the human environment, required by law, regulation, Executive Order and policy, to determine if they would be affected by the proposed project (BLM Handbook H-1790-1: p. 137), [40 CFR 1508.27(b)(3)], [40 CFR 1508.27(b)(8)] (*see EA Section 3.3.12*), as well as the issues raised in scoping (see *EA Section 1.8.3*).

The resources potentially affected by the proposed thinning activities are described in the following sections: Vegetation and Forest Stand Characteristics; Hydrology; Fisheries and

Aquatic Habitat; Soils; Wildlife; Air quality and Fire Hazard/Risk; Recreation, Visual Resources and Rural Interface; and Cultural Resources.

3.3.1 Vegetation and Forest Stand Characteristics

Sources: *Outer Limits/Fawn Two Silvicultural Prescription, Bonney 2015. Outer Limits/Fawn Two Fuels Specialist Report, Mortensen et. al 2015. Cascades Resource Area EA Wildlife Report for Outer Limits, Cascades Resource Area EA Wildlife Report for Fawn Two, Murphy 2015(Wildlife Report).*

Assumptions:

- As Relative Density(RD)[28] increases above 50, competition for light, nutrients and water begins to reduce growth rates and increase stresses on individual trees and on the stand as a whole.
- Forest stands with RDs about 65 have lower tree vigor, high mortality of suppressed trees, and higher susceptibility to insects, disease and more severe fire behavior than stands with lower densities (*Perry 1994; Hann and Wang 1990; Curtis 1982*). These conditions reduce stand resiliency and resistance to environmental stresses.
- In forest stands where the live crown ratios decline to less than 30 percent, individual trees are slower to respond to a thinning designed to maximize tree growth and stand structural development (*Tappeiner et. al 2007*).

Methodology:

- For stand structure information, Stand Exams were conducted in 2007 and 2014. BLM's Cascades RA Silviculturalists did field reconnaissance of all proposed harvest units.
- The plot data was analyzed by the Cascades RA Silviculturalist using BLM's EcoSurvey Program and the ORGANON growth model (*Hann et al 2006*). The BLM analyzed and incorporated data into the description of existing vegetation and forest stand characteristics and for developing the prescriptions that would be implemented under the proposed project (*EA Table 15, Sivlicultural Report*). Stand ages were calculated by these programs using weighted averages of sample ring counts (cores) to determine a stand "birthdate".
- Threatened/Endangered/Special Status/Special Attention Botanical Species: BLM botanists for the Cascades RA conducted two types of surveys within the project area and vicinities; Known Site Surveys (data search) and Field Surveys (Botanical Inventory). The Botanist conducted comprehensive botanical inventories of the project area in June, July, September and November of 2014.

3.3.1.1 Affected Environment

Land Status

The following 3 tables, compiled from the Little North Santiam River Watershed analysis (1997) and the North Santiam Watershed Analysis (2002) show the seral stage acres in the 5th field Watersheds, seral stage acreage on federal lands by LUA, and the definitions for seral stages. This acreage shows general patterns well, but acres may differ from current BLM GIS data which is used elsewhere in the EA.

[28] Relative density is a measure of crowding in a stand of trees, expressed as a percentage of density (based on number and size of trees) relative to a theoretical maximum density. Curtis Relative Density is calculated by dividing the basal area per acre by the square root of the quadratic mean diameter. Other common ways of communicating density in a forest stand include trees/acre, basal area/acre, average spacing and crown or canopy closure.

The seral stage data associated with the North Santiam Watershed Analysis incorporates two 5th field Watersheds: the Lower North Santiam 5th field watershed, and the Middle North Santiam 5th field watershed. The Outer Limits area is within the Middle North Santiam Watershed, however the watershed analysis did not disseminate between 5th field watersheds when describing seral stages. To see the breakout in seral stages on BLM land within the Middle North Santiam 5th field watershed, refer to Table 2 in EA Section 1.3.1.1.

Table 11. **Seral Stage Acres by Ownership – Little North and Lower/Middle North Santiam 5th Field Watersheds**

Seral Stage used for Watershed Analysis (years)	**Ownership – Little North Santiam 5th field Watershed**					
	Federal		Non-Federal		Totals	
	Acres	%	Acres	%	Acres	%
Non Forest	2,734	6	2233	10	4967	7
Early-Grass Forb. (0-14)	1,682	3	3308	15	4990	7
Open Sapling/Brush (15-34)	4,038	8	4298	19	8336	12
Closed Sapling (35-74)	6,943	14	10310	45	17253	24
Mature (75-200)	16,667	34	2573	11	19240	26
Old Growth (200+)	17,302	35	69	<1	17371	24
Totals	**49, 366**	100	**22791**	100	**72157**	100
Seral Stage used for Watershed Analysis (years)	**Ownership – Lower/Middle North Santiam 5th field Watershed**					
	Federal		Non-Federal		Totals	
	Acres	%	Acres	%	Acres	%
Non Forest	**400**	5	**68651**	56	**69051**	53
Early-Grass Forb. (0-10)	**787**	10	**14322**	12	**15109**	12
Open Sapling/Brush (10-40)	**839**	11	**1544**	1	**2383**	2
Closed Sapling (40-80)	**2975**	38	**29027**	24	**32002**	25
Mature (80-200)	**2609**	33	**9109**	7	**11718**	9
Old Growth (200+)	**198**	3	**59**	<1	**257**	<1
Totals	**7808**	100	**122,712**	100	**130,520**	100

Table 12. **Seral Stage Acreage on Federal Lands by LUA in Little North Santiam 5th Field Watershed**

Seral Stage used for Watershed Analysis	LUA						Totals
	Matrix (CONN/GFMA)		LSR, DDR, WSR		SRA, Wilderness		
	Acres	%	Acres	%	Acres	%	Acres
Non Forest	569	5	591	8	1574	5	2734
Early-Grass Forb.	991	9	168	2	523	2	1682
Open Sapling/Brush	1743	15	673	10	1622	5	4038
Closed Sapling	4023	35	534	7	2386	8	6943
Mature	3740	33	2626	35	10301	34	16667
Old Growth	330	3	2808	38	14164	46	17302
Totals	11396	100	7400	100	30570	100	49366

Table 13. **Seral Stage Acreage on Federal Lands by LUA in Lower/Middle North Santaim 5th Field Watersheds**

Seral Stage used for Watershed Analysis	LUA				Totals
	Matrix (CONN/GFMA)		LSR		
	Acres	%	Acres	%	Acres
Non Forest	397	5	3	2	400
Early-Grass Forb.	786	10	1	1	787
Open Sapling/Brush	807	11	32	26	839
Closed Sapling	2967	37	8	7	2975
Mature	2580	35	29	23	2609
Old Growth	148	2	50	41	198
Totals	7685	100	123	100	7808

Table 14. **Seral Stage Definitions**

Seral stage used for Watershed Anslysis	Age Class (years) Lower/Middle North Santiam	Age Class (years) Little North Santiam	Seral Stage used for Wildlife Habitat**	Age Class
Non Forest	*	*	*	*
Early-Grass Forb.	<10	0-14	**Early Seral**	0 to 30
Open Sapling/Brush	11 to 40	15-34	**Early Mid Seral**	30 to 40
Closed Sapling	41 to 80	35-74	**Mid Seral**	40 to 60
			Late Mid Seral	60 to 80
Mature	81 to 199	75-200	**Early Mature Seral**	80 to 120
			Mature	120 to 200
Old Growth	200+	200+	**Old Growth**	200+

***Seral Stage definitions based on RMP/FEIS glossary, p 6-13. See Also EA 3.3.5.1*

Stand Structure and Development

The forest stands proposed for treatment are well stocked to overstocked, early mid-mature, mid-mature to mature conifer-dominated stands. Table 15 provides a summary of key descriptors for each unit.

Matrix/CONN in Fawn Two Area

The RD in Fawn Two associated units is around 53 with a high canopy closure just below 70 percent. The stocking of these stands is around 78 dominant trees per acre (TPA).

Units 25A and B: Both units are part of a larger stand approximately 319 acres in size, with 64 acres proposed for harvest in this project. This stand consists of 134 year old mature Douglas-fir (*Pseudotsuga menziesii*) with a few dominant western hemlock (*Tsuga heterophylla*) per acre. One legacy Douglas-fir was located near an old logging road in the southeast corner of unit A. In addition to the dominant Douglas-fir in this stand, there are up to 80 trees per acre of western hemlock advanced regeneration ranging from 5 up to 50 feet tall in places. In unit A there are two pockets of laminated root rot (*Phellinus weirii*) about a tenth of an acre in size containing approximately 10 hard and soft standing snags each. Under story vegetation includes sword fern (*Polystichum munitum*), Oregon grape (*Mahonia aquifolium*), red huckleberry (Vaccinium parvifolium) and salal (*Gaultheria shallon*). Unit 25A was commercially thinned in 1972; Unit 25B was commercially thinned in 1982 (*see EA Section 3.2 Physical and Historical Setting*).

Matrix/CONN in Outer Limits Area

The RD in the Outer Limits associated units range from 65 to 80 with very high canopy closures ranging from 86 to 88 percent. Trees per acre range from relatively high stocking of 159 TPA to a very high stocking of 328 TPA. Stand descriptions below include the Riparian Reserve acres.

Unit 17A: Has characteristics of late mid, to early mature seral stage and encompasses three separate stands (*see Table 15*). The average ages of theses stands range from 89 to 101 years. This entire unit is dominated by western hemlock and Douglas-fir with a component of western red-cedar (*Thuja plicata*) in places. One western white pine (*Pinus monticola*) was discovered along the eastern edge of the unit. There is a ½ acre patch of trees that are older than the surrounding stand; otherwise there is little or no vertical or horizontal structure present. Understory vegetation is scarce throughout most of the unit due to the high tree density. Although scarce, other understory species include dwarf Oregon grape (*Mahonia nervosa*) , bear grass (*Xerophyllum tenax*), sword fern and wood sorrel (*Oxalis sp*.).

Stand age indicates that it likely regenerated after a stand replacing fire approximately 90 years ago. There are numerous soft snags in the stand 5 to 50 feet tall, with evidence of charring from a possible wildfire (*See EA Section 3.3.6 Timber Stand and Fire History*) .

One stand in the 17A unit is very dense, with over 300 green trees per acre. This area has trees with smaller diameters and small crown ratios. The crown ratios average around 30 percent in this portion, with some crowns around 25 percent (*see Silviculture Report*). Thinning will produce marginal volume as many of the cut trees will be too small to be considered merchantable. Modeling in ORGANON predicts that thinning to a Curtis RD of 34 will result in the harvest of 8793 bf per acre. Some residual trees appear healthy enough to respond to a thinning but the response may be slow and the majority of trees have sparse crown ratios below 30 percent. This area is proposed for regeneration harvest in the proposed action alternative (*see Table 15, EA Section 1.3.1.1*).

Unit 17B: The proposed harvest area in 17B is approximately 28 acres of an 82 acre stand dominated by Douglas-fir, with some western hemlock and noble fir (*Abies procera*). There is an established understory of Oregon oxalis (*Oxalis oregana*), sword fern, blue huckleberry (*Vaccinium membranaceum*), bear grass, pacific Rhododendron (*Rhododendron macrophyllum*) and Oregon grape. There is little vertical or horizontal structure present, and no records of previous thinning treatment.

Units 29A,B,C,D,E and F: These proposed harvest units are all part of one, 375 acre stand in Section 29 that straddles the north and south sides of Rock Creek, which flows west through the section (*see Maps Section 1.2*). This stand consists primarily of Douglas-fir with some western hemlock and noble fir. There is some western hemlock advanced regeneration in the understory. The units north of Rock Creek are mostly Douglas-fir and are more open containing considerable understory vegetation including pacific rhododendron, bear grass, Oregon grape, bunchberry dogwood(*Cornus canadensis*) and oxalis. South of Rock Creek the stand is denser, with less understory vegetation and bare ground in places.

Table 15. **Stand attributes of proposed harvest areas, before and after treatment**

T-R-S Unit, Proposed or Alternative (Alt.) Action	harvest acres[29]	Stand Age	Proposed thin acres RR	Seral Stage	CWD feet/ acre[30]	Snags/ac >15" Dia. & >15' Tall	Current Conditions			Average Dia Year 20 no treatment	After Treatment			
					Hard/ Soft	Hard/ Soft	Trees per acre	Avg. Dia. (in)	Curtis RD		Trees per acre	Avg. Dia. Year 1	Ave. Dia. Year 20	Curtis RD Yr. 1
Outer Limits Area														
T10S-R4E-17A Alt.Action	16	93	0	Early-Mature	0/355	0/0	328	10.9	65	12.2	118	14.2	16.2	34
T10S-R4E-17A Proposed Action	16	93	0	Early-Mature	0/355	0/0	328	10.9	65	12.2	16	20.1	22.9	8
T10S-R4E-17A Proposed Action and Alt. Action	46	89	5	Early-Mature	0/355	210/630	219	14.8	68	16.4	74	19.2	21.6	34
T10S-R4E-17A Proposed Action and Alt. Action	7	101	1	Early-Mature	0/355	210/630	159	21.8	80	21.8	48	26.2	28.7	35
T10S-R4E-17B Proposed and Alt. Action	28	91	7	Early-Mature	0/347	0/1270	216	16.4	78	18.3	75	19.6	22.1	35
T10S-R4E-29A,B,C,D,E,F Proposed and Alt. Action	208	76	75	Late Mid-Seral	0/260	0/40	236	14.8	74	16.8	55	21.2	24.6	30

[29] These acres do not include the 3 acres of Right-of-Way proposed for the project (see Table 4)

[30] Linear feet/acre, greater than 19 inches diameter and over 20 feet long, hard (decay classes 1-2)/soft (decay classes 3-5) logs.

Table 15 continued

T-R-S Unit, Proposed or Alternative (Alt.) Action	harvest acres[32]	Stand Age	Proposed thin acres RR	Seral Stage	CWD feet/ acre	Snags/ac >15" Dia. & >15' Tall	Current Conditions			Average Dia Year 20 no treatment	After Treatment			
					Hard/Soft	Hard/Soft	Trees per acre	Avg. Dia. (in)	Curtis RD		Trees per acre	Avg. Dia. Year 1	Ave. Dia. Year 20	Curtis RD Yr. 1
Fawn Two Area														
T10S-R4E-25A,B Proposed Action	63	134	0	Mature	0/246.9	0/3.9	78	24.9	53	27.7	18	36.9	41.0	21
T10S-R4E-25A,B Alternative Action											45	24.9	28.7	30

Threatened/Endangered/Special Status/Special Attention/Survey and Manage Plant Species

No Threatened and Endangered vascular plant or suitable habitat was found during field surveys and there are no known sites within the proposed harvest area(s) as determined by a known site data search.

No Special Status Species or Survey and Manage species were found during field surveys and there are no known sites for any botanical species that require protection within the proposed harvest area(s) as determined by a known site data search.

Invasive / Non-native Plant Species (including Noxious Weeds)

In the Fawn Two area:

During field surveys the following invasive/non-native species were found to occur adjacent to the proposed harvest areas within road corridors; tansy ragwort (*Senecio jacobaea*), Canadian thistle (*Cirsium arvense*), St. John's wort (*Hypericum perforatum*), scotch broom (*Cytisus scoparius*), Himalayan blackberry (*rubus discolor*), ox-eye daisy (*Leucanthemum vulgare*), reed canary grass (*Phalaris arundinaceae*) and English holly (*Ilex aquifolium*).

In the Outer Limits area:

During field surveys the following invasive/non-native species were found to occur adjacent to the proposed harvest areas within road corridors; tansy ragwort (*Senecio jacobaea*), Canadian thistle (*Cirsium arvense*), bull thistle (*Cirsium vulagre*), St. John's wort (*Hypericum perforatum*), scotch broom (*Cytisus scoparius*), Himalayan blackberry (*rubus discolor*), .

3.3.1.2 Environmental Effects

Proposed Action

Stand Structure and Development after Regeneration Harvest

Observed Characteristics and Direct Effects Immediately after Treatment

Immediately following regeneration harvest and site preparation in both the Fawn Two and Outer Limits areas the stands would appear very open and the residual trees should appear healthy with minimal damage. The site should have minimal soil disturbance from yarding. Small diameter (less than 6 inches) logging slash and debris would be absent over most of the units, though some areas would retain varying amounts of slash due to variations in burning conditions. Most of the duff layer would be present because burning would be timed so most of the moist duff would not burn; some mineral soil would be exposed by the combination of logging and fire.

In the Fawn Two Area

There should be approximately 16-22 dominant trees per acre, both scattered and aggregated within the units, recently fire-killed snags, and pre-exiting snags and coarse woody debris. The retained trees should be among the largest in the stand and the majority should be 20" DBH and larger.

In the Outer Limits Area

In the 16 acres of regeneration harvest there should be approximately 15-18 dominant trees per acre, recently fire-killed snags, and pre-existing snags and coarse woody debris. The largest, healthiest conifers will be retained, and the remaining green trees should be retained in a combination of clumps and scattered individual trees. They should consist of primarily Douglas-fir and western hemlock.

After harvest, these stands in both areas would be reforested with approximately 440 conifers per acre. The plantations will be composed of Douglas fir and western red cedar with a minor component of other species indigenous to the site. Western hemlock is expected to seed in naturally.

Observed Characteristics and Trends in the Long Term

Many of the retained green trees would survive as legacy trees within the growing forest stand while others die and become snags or CWD. The surviving green trees would develop large crowns as limbs continue to grow instead of self-pruning under a closed canopy. Wind, lightning, insects, disease and silvicultural practices would be expected to turn more live conifers into snags and CWD, during the next few decades.

The planted seedlings will be maintained; any vegetation control would likely be limited to mechanized brushing. The harvested areas will eventually become well-stocked of young conifers, planted and naturally regenerated. Ongoing surveys would determine if additional planting, snag creation, CWD creation or other silvicultural practices would be implemented during the next two decades to meet management plan guidelines.

Early Seral Habitat Development after Treatment

Observed Characteristics and Direct Effects Immediately after Treatment

Existing shrubs and ground-cover plant species would begin to sprout from existing stumps and root systems after site preparation and grow rapidly from the established root systems. Before crown closure, flowering, fruiting, and forage vegetation species should be abundant within a few years.

Observed Characteristics and Trends in the Long Term

Understory vegetation would increase in vigor for two or more decades, then decline in vigor as conifer crowns close together and increasingly shade the forest floor. Although the regeneration harvest areas would be reforested with native conifer species; limited vegetation control would result in a longer period of stand establishment, providing up to 20 years of conditions that favor forbs, grasses as well as flowering and fruiting shrubs.

Currently, the early-seral habitat (age 0-39 years) makes up 7 percent of the forested BLM-managed acres in the Little North Santiam 5th field watershed, with 9 percent in the Middle North Santiam 5th field watershed. The youngest (1-20 years of age) early-seral habitat makes up only 1 percent in the Little North Santiam, and 2 percent in the Middle North Santiam. Harvest of 64 acres in Fawn Two would increase early-seral habitat in the youngest early-seral habitat (age 1-20) from 1 percent to 2 percent. Harvest of 16 acres in Outer Limits would increase early-seral habitat from 2 percent to 3 percent (*see Table 1 for BLM ownership Seral Stages*). An increase in early seral habitat on all of federal lands in these watersheds would be less than 1 percent.

The photos below show lower density and regeneration sale areas 12-15 years after harvest in the Cascades RA.

Figure 10: Fawn Creek timber sale area Harvested in 2003. Current condition: 26 dominant TPA. T8S, R3E, Section 25.

Figure 11: Roland Minto Regeneration Harvest Unit Harvested in 1998. Current condition: 8-12 dominant TPA. T9S, R4E, Section 19

Stand Structure and Development after Thinning in the Matrix

Observed Characteristics and Direct Effects Immediately after Treatment

This proposal would increase the growth rates of the residual trees remaining after thinning. The stands should appear healthy with wider spacing between trees, and more uniform in spacing and in diameter and height than before treatment. The average diameter of the forest stand would be larger than prior to thinning because "thinning from below" primarily removes the smaller and less healthy trees from the stand, and larger conifers would be targeted for retention.

Tree crowns would be more widely spaced, allowing more light to reach the forest floor. The wider spacing of the residual trees will result in increased growth of understory trees and shrubs which will provide a richer more diverse habitat for wildlife. The low density thinning area in Section 29 would encourage the growth of native early-seral shrub species and understory conifer and deciduous trees. These species provide important habitat for both avian and mammal species meeting the objectives for CONN areas.

Some, but minimal damage is expected to the residual trees from logging operations. Scraping of bark and damage to roots can be expected in or near yarding roads. There would be some visible damage to retained trees, but contract requirements and administration would prevent more than two trees per acre being damaged for more than half the circumference as defined in the PDFs. Any damaged trees will be retained in the stand to serve at potential near-term snags to increase the structural complexity of the stand. Additionally any standing snags, except for those felled for operator safety should be retained to provide an important structural legacy for the stand in keeping with CONN objectives. The total net yield for the stands will not change but the final harvest volume will have larger and higher quality timber. By following standard BMPs for logging the soil disturbance will be kept to a minimum and should not adversely affect long term stand productivity.

Observed Characteristics and Trends in the Long Term

In the long term (10-30 years), tree crowns would continue to grow larger as limbs grow longer and lower limbs continue to grow instead of dying and self-pruning. As crown closure increases (limbs grow and fill in the open space in the tree canopy) the amount of light reaching the forest floor would diminish. Understory plants will grow rapidly in response to increased light then begin to decline in vigor in the second decade as crown closure increases. Some areas of damaged bark and cambium on retained trees would heal while some of the trees with more than 50 percent of the circumference damaged would be expected to develop decay pockets or die and become snags. Some individual tree and small group wind throw is expected during infrequent high wind events. These snags and down CWD will increase habitat for snag-dependent species.

Indirect Effects

Indirect effects would include increased diameter growth rates on retained trees increasing due to decreased competition for site resources (light, water, nutrients) resulting in larger trees available for future harvest or other management options (*see Table 15*). Crown ratios would increase due to lower crowns and larger limbs when compared to trees in an overstocked stand. Stand structure would become more complex as understory and ground cover develops, compared to an overstocked stand with limited light reaching the forest floor.

Tree mortality, windthrow and decay that began as a result of injury to some trees would add snags and CWD elements of structural complexity of the stands.

The following photo shows a typical stand resulting immediately after thinning treatment.

Figure 12: "Lost Lulay" thinning treatment in 2013. T10S, R1E, Section 25.

Stand Structure and Development after thinning in the Riparian Reserve

Observed Characteristics and Direct Effects Immediately after Thinning

Immediately following timber harvest the thinned stands would be very similar to the adjacent Matrix stands. The stands would be more uniformly spaced and more uniform in diameter and height than before treatment; portions of the stands within the Riparian Reserve are generally too dense to facilitate immediate development of older forest characteristics. Average diameter of trees should increase as many of the smaller diameter trees are removed from the stand. Some Forked topped and deformed trees will be retained in the stand for wildlife habitat.

Some logging damage would be evident. Some (up to 2 per acre each) additional snags (girdled trees) and CWD would be added to the stands by not removing some merchantable trees which would be damaged by equipment or felled to facilitate logging (*EA Section 2.3.1 and Table 7 PDFs*).

Observed Characteristics and Trends in the Long Term

Tree and forest stand growth patterns would be similar to those described for the adjacent Matrix stands. Growth of residual trees would increase and continue at a steady rate over the next 20 years. Crowns should expand and fill the gaps left in the canopy until the site is fully occupied. An increase in understory vegetation growth is expected initially but will become less vigorous as the canopy closes. Some conifer regeneration is expected. Advanced regeneration already in the stands will increase in growth and vigor.

Trees would continue to die, break, and/or fall due to disease, lightning, wind throw or snow break which would add to the numbers of decadent and asymmetric trees, snags and dead/down wood in the stands. Silviculture treatments may also be done to create additional habitat features in the future.

Indirect Effects

As described above for the adjacent Matrix stands, increased growth rates would result in fewer, but larger diameter, trees in the stands compared to unthinned stands. In addition to the effects described for the adjacent Matrix stands, the following effects which contribute to meeting the objectives of the Riparian Reserve LUA are described here:

Just as with the larger diameter of the overstory (dominant and co-dominant) trees, retained trees in the understory (intermediate and suppressed) would also grow larger in diameter due to increased sunlight penetrating through the canopy until the canopy closes and again suppresses those trees over the following several decades. Some of those would eventually die from suppression mortality in the next several decades and the resulting snags and down woody debris would persist longer as dead wood habitat and be valuable to more species than if they had died while they were small diameter trees.

The trees would develop deeper crowns which have more whorls of live limbs growing on a larger proportion of the total height of the trees because the limbs live longer. Deep crowns and large limbs provide microclimate and habitat features that are different from the shallow crowns and small diameter limbs found in an overstocked stand and provide habitat for species which prefer large limbs and crowns.

When large trees with large crowns die or fall over the next several decades, additional sunlight would reach the forest floor and stimulate growth in patches of the understory. Where a closed canopy remains intact, the understory would decline in vigor over the next several decades. These differences increase the structural complexity of the understory.

Threatened/Endangered/Special Status/Special Attention/Survey and Manage Plant Species

There are no known Threatened/Endangered/Special Status/Special Attention/or Survey and Manage species or habitat within the proposed Fawn Two or Outer Limits harvest areas. Due to the nature of the proposed project, potential adverse impact to suitable habitat or any undiscovered Special Status or Survey and Manage species is not anticipated.

Invasive, Nonnative Species

In timber harvest areas adjacent to the proposed project area(s) there was no evidence to indicate that adverse impacts from invasive/non-native species would occur as a result of the proposed project. With mitigation measures in place, it is not anticipated that the proposed project would contribute measurably to the cumulative effects of invasive/non-native species in Oregon.

A Noxious Weed Risk Assessment (BLM Manual 9015) of the proposed project area was conducted and the area was found to have a risk assessment rating of moderate. A moderate rating indicates the proposed project should proceed as planned with the PDFs in place to control the spread of the existing invasive/non-native species populations and prevent the introduction of new invasive/non-native plant species.

Cumulative Effects

Regeneration Harvest

The Outer Limits/Fawn Two project is located in two 5th field watersheds, the Little North Santiam, and Middle North Santiam. The Outer limits regeneration harvest unit is 16 acres, with the Fawn Two portion being 64 acres. In Outer limits, this equates to approximately 0.25 percent of the Middle North Santiam 5th field watershed. Approximately 0.42 percent of the Little North Santiam 5th field watershed includes the Fawn Two area. Due to the small size of the overall project, impacts to natural vegetation within these watersheds from the implementation of regeneration harvest are localized.

Thinning

No cumulative effects at the watershed level would be expected for the Outer Limits area with regard to forest cover because the proposed thinning would maintain a forested setting in the same age class as before thinning and would not change overall vegetation patterns in the watershed.

Threatened/Endangered/Special Status and Survey and Manage Plant Species

No suitable habitat to support any T&E species was identified within or adjacent to the proposed project areas, therefore not cumulative effects are expected. Due to the nature of the proposed project and the habitat modification that would occur, suitable habitat to support some Special Status and Survey and Manage Species within the proposed project areas would be modified but not lost. Suitable habitat would remain in reserve areas adjacent to the proposed harvest areas and although indirect impact (i.e. increased sunlight, temperature increase, etc.) to reserve areas may occur, no adverse impact to that habitat is anticipated.

Invasive/Non-native Plant Species

No cumulative effects are expected with regard to invasive/non-native plants because the project would not contribute to the spread of invasive species populations or to the introduction of new species with the implementation of PDFs; and little or no difference in the composition or numbers of invasive/non-native species populations have been observed in similar projects on BLM lands in the vicinity.

Alternative Action

Under the Alternative Action in this project, all stands would be thinned, and no regeneration harvest would take place. Under the Alternative Action, all proposed treatment areas in the Outer Limits area would have a prescription of "thin from below" and the 64 acres in the Fawn Two area would include a "proportional thinning" prescription.

Stand Structure and Development of Thinning in the Matrix

Observed Characteristics and Direct Effects Immediately after Thinning

In the Outer Limits area, all observed characteristics and direct effects following a "thin from below" prescription in all units is identical to those described in the Proposed Action.

In the Fawn Two area, both stands 25A and 25B would have a prescription described as a "proportional thinning" under this Alternative Action. The proportional thinning prescription would leave clumps, gaps, and a variability of size classes within the stands after treatment. Immediately after timber harvest and site preparation the stands would appear open, with an average of 45 trees per acre; however, this thinning prescription would not leave a uniform distribution of trees; tree spacing and size would vary throughout the stands. There would be 10-15 unthinned "clumps" in each harvest unit; each clump would be approximately 1 acre in size and retain all trees and vegetation within these clumps.

In the more open areas outside the clumps, existing shrub and ground-cover plant species would begin to sprout from existing stumps and root systems after any site preparation and grow rapidly from the established root systems. Before crown closure, flowering, fruiting, and forage vegetation species should be in abundance within a few years.

Observed Characteristics and Trends in the Long Term

In the Outer Limits area, observed characteristics and trends in the long term following a "thin from below" prescription is identical to those described in the Proposed Action, with the exception of a portion of unit 17A. A portion of 17A (proposed as a regeneration harvest in the Proposed Action) with over 300 TPA prior to treatment will respond slower than the surrounding stands. This is due to the very high densities of trees (over 300 TPA) and smaller crown ratios in this portion of the stand. The crown ratios average around 30 percent in this portion, with some crowns around 25 percent. Once the live crown ratios decline to less than 25 percent it becomes less likely that individual trees will respond to a thinning designed to maximize tree growth and stand structural development. Although the response in growth from the thinning will be slow, the remaining trees will grow throughout the first decade.

In the proportional thinning, tree crowns will continue to grow as limbs grow longer with the increase in space and light. In the 1 acre clumps, height growth would continue at the current rate while diameter growth would slow with the trees in the interior portions of the clumps. Crowns of the trees that are along the outside of the clumps and individually scattered throughout the unit will grow into the open spaces.

In the more open areas the shrubs and forage species would become established and grow, and it is expected early-seral, shade intolerant ground cover and brush species would grow for one to three decades, until conifers become established. Western hemlock would seed in naturally, and any planted Douglas-firs and western redcedar would become well established. The canopy layering would develop as these young trees grow and the shade-intolerant species would decline in vigor over the next several decades.

Indirect Effects

In the Outer Limits area, all anticipated indirect effects associated with a "thin from below" prescription in this alternative is identical to those described in the Proposed Action.

The indirect effects associated with the proportional thin prescription are similar to those stands that are proposed for a thin-from-below regime. With the exception of the "clumps" in the proportional thinning, the increased growth rate of the retained trees would result in these trees growing larger in diameter over the next 20 years than they would if the stand were not thinned (*see EA Table 15*). Larger diameter trees also provide source material for higher quality snags,

CWD and legacy trees. Larger crowns are correlated with increase vigor of individual trees and of forest stands and provide habitat for species which prefer large limbs and crowns.

While large trees with large crowns in the open areas die or fall over the next several decades, additional sunlight would reach the forest floor and stimulate growth in patches of the understory. Where a closed canopy remains intact (clumps), the understory would decline in vigor over the next several decades. These differences increase the structural complexity of the understory and the stand overall.

Threatened/Endangered/Special Status/Special Attention/Survey and Manage Plant Species

There are no known Threatened/Endangered/Special Status/Special Attention/or Survey and Manage species or habitat within the proposed Fawn Two or Outer Limits harvest areas. Due to the nature of the Alternative Action, potential adverse impact to suitable habitat or any undiscovered Special Status or Survey and Manage species is not anticipated.

Invasive, Nonnative Species

In timber harvest areas adjacent to the proposed project area(s) there was no evidence to indicate that adverse impacts from invasive/non-native species would occur as a result of the Alternative Action. With mitigation measures in place, it is not anticipated that the proposed project would contribute measurably to the cumulative effects of invasive/non-native species in Oregon.

A Noxious Weed Risk Assessment (*BLM Manual 9015*) of the proposed project area was conducted and the area was found to have a risk assessment rating of moderate. A moderate rating indicates the proposed project should proceed as planned with the PDFs in place to control the spread of the existing invasive/non-native species populations and prevent the introduction of new invasive/non-native plant species.

Cumulative Effects

Thinning

No cumulative effects at the watershed level would be expected for the Alternative Action with regard to forest cover because the proposed thinning would maintain a forested setting in the same age class as before thinning and would not change overall vegetation patterns in the watershed.

Long term (2 or more decades) cumulative effects are expected to begin accelerating development of currently underrepresented early seral, and late-successional forest characteristics in the proportional thinning area.

Threatened/Endangered/Special Status and Survey and Manage Plant Species

No suitable habitat to support any T&E species was identified within or adjacent to the proposed project areas, therefore no cumulative effects are expected. Due to the nature of the Alternative Action and the habitat modification that would occur, suitable habitat to support some Special Status and Survey and Manage Species within the proposed project areas would be modified but not lost. Suitable habitat would remain in reserve areas adjacent to the proposed harvest areas and although indirect impact (i.e. increased sunlight, temperature increase, etc.) to reserve areas may occur, no adverse impact to that habitat is anticipated.

Invasive/Non-native Plant Species

No cumulative effects are expected with regard to invasive/non-native plants because the project would not contribute to the spread of invasive species populations or to the introduction of new species with the implementation of PDFs; and little or no difference in the composition or numbers of invasive/non-native species populations have been observed in similar projects on BLM-administered lands in the vicinity.

No Action Alternative

Stand Structure and Development (all LUAs)

In the short term the current stands would continue to grow to increasing density. In the untreated, overstocked stands height growth would continue at approximately the current rate while diameter growth continues to slow. Slower diameter growth develops stronger wood with a higher proportion of heartwood compared to faster growth, but it takes longer to develop source material (large diameter live trees) for recruiting the large-diameter dead wood (snags and CWD) that are especially valued as habitat (*see EA Section 3.3.5 Wildlife*). Heartwood is generally stronger and more decay resistant than sapwood, so a higher percentage of heartwood with smaller growth rings tends to result in suitability for some high-strength wood products and more durable dead wood which persists longer in the forest stand.

The limbs of closely spaced trees in an overstocked stand touch and interlock, blocking most of the sunlight from reaching anything below the dense canopy. Lower limbs of dominant and co-dominant trees, the entire crown of trees in the intermediate and suppressed positions, and understory vegetation in the stand would continue to be shaded. In addition to competing for light, all vegetation would compete for limited nutrients and water. Competition for site resources of light, water and nutrients leads to the following trends:

As lower limbs in the crown self-prune, crown size relative to the height of the tree (crown ratio) would continue to decrease. This leaves tall, clean boles with no limbs below a relatively small crown. As this trend continues trees lower limbs are shaded by adjacent trees, very few crowns develop large diameter limbs which may reduce stand vigor and so reduce resilience and resistance to disease, insects, wind and fire. Clear boles with small knots contribute to higher lumber grades while small diameters contribute to higher logging and processing costs.

The smallest trees would die from lack of sufficient site resources, a process called "suppression mortality" which naturally thins the stand. Over time, suppression mortality limits or eliminates conifers from the understory positions in the stand. This natural thinning process creates relatively large numbers of small diameter snags from the smallest trees in the stand. Small diameter snags tend to be short-lived in the stand, falling to become short-lived, small diameter woody debris on the forest floor. Trees which die from suppression mortality are lost as potential commercial forest products.

Understory vegetation including conifer reproduction, brush and ground cover plants would decrease in abundance, size and species diversity without sufficient light reaching the forest floor.

The accumulation of small diameter dead and decaying wood on the forest floor increases fuel loads without green vegetation to hold moisture. This increases potential for fire spread and resistance to control in the stand (*EA Section 3.3.6 Air Quality and Fire Hazard/Risk*).

Trees would continue to grow with a slower rate compared to thinned stands, yielding larger numbers of smaller diameter stems with denser wood (higher ring count per inch) and a higher proportion of heartwood compared to thinned stands. In Matrix stands these trends affect sustained yield timber production because: The future logging costs per unit of wood volume would be higher for many small logs compared to the same board foot volume in fewer large logs. The market for wood with those characteristics would probably be different from the faster grown wood that results from thinning, but there are too many market variables to predict relative value. Suppression mortality would result in those trees never being harvested for wood products, reducing the total net yield and value of the stands over the full rotation.

In Riparian Reserve stands these trends are important because the long term, indirect effects of stands developing from overstocked stands often delay or preclude characteristics associated with some late-successional and old-growth stands such as large diameter trees, snags and CWD, large crowns with large diameter limbs, healthy conifers in understory and intermediate canopy positions, and well developed understories of brush and ground cover species. Many of the desired characteristics would eventually develop without silvicultural management but these fully to overstocked conifer stands are overrepresented at the landscape level on BLM lands and No Action Alternative would miss the opportunity to increase the variety of stand types across the landscape (diversity) which provides a wider variety of stand structures and habitat for a variety of species than large tracts of uniform stands provide.

The dominant trees in some existing old-growth forest stands have long (100 feet), clean boles, while others developed with large limbs much nearer the ground (less than 50 feet). It appears (BLM observations, personal communication) that the first type grew from dense stands that self-pruned and the large trees survived for centuries while many of the smaller trees died and allowed multiple stories to develop. The No Action Alternative would trend toward extensive stands of relatively uniform and dense second growth forests developing along the first trajectory while bypassing the opportunity to introduce the second trajectory in the stands proposed for treatment under the action alternatives.

Tappenier et al. (1997) determined that the complex stand structure associated with some old-growth forest stands with large limbs lower on the bole apparently developed with low stocking levels (as low as 40-50 trees per acre) rather than from self-thinning of overstocked stands. Stands with this type of old-growth trajectory based on lower densities would be rare in the uniform stands in this watershed without management action.

Threatened/Endangered/Special Status/Special Attention/ Survey and Manage Plant Species and Invasive / Non-native Plant Species (including Noxious Weeds)

No changes to existing conditions and trends would be expected.

3.3.2 Hydrology

Sources: *Hydrology/Channels/Water Quality: Specialist Report s for the Outer Limits and Fawn Two areas (Hydrology Report) Hawe, 2015; Fisheries Report*

Methodology:

- BLM's Cascades RA Hydrologist researched public records for beneficial uses and various aspects of water quality and stream status.
- The Hydrologist examined the project area and vicinity to determine current status of stream conditions, water quality, stream locations and wetlands.

- The Hydrologist used the State of Oregon Risk Assessment tool to evaluate the immediate and cumulative effects of potential harvest on peak flows in area streams.
- The Hydrologist evaluated roads, stream crossings and proposed logging and road work plans to evaluate current and potential sources of sediment.

3.3.2.1 Affected Environment

Precipitation and Basin Hydrology

The Fawn Two area is located in the Oregon Western Cascades range at elevations between 1,600-2,260 feet[31]. The Fawn Two units are in the transient snow zone (TSZ), an elevation zone subject to rain-on-snow events (ROS) that have the potential to increase peak flows during winter or spring storms. This zone varies with temperature during winter storms but is assumed to lie between 1,500 - 3,000 feet in elevation.

The Outer Limits units are in the snow zone at elevations between 3,000 and 4,300 feet in elevation; above the elevation zone subject to ROS.

The Fawn Two area receives approximately 83-94 inches of rain annually and has a mean 2-year precipitation event of 4.0 inches in a 24-hour period while the Outer Limits area receives approximately 100-110 inches of rain annually and has a mean 2-year precipitation event of 5.4 inches in 24-hour period (estimated at: http://www.nws.noaa.gov/ohd/hdsc/noaaatlas2.htm).

The Fawn Two area drains to two separate 7th field sub-watersheds with approximately 1,847 acres (2.9 miles^2) in combined drainage area. The Outer Limits area is in the Rock Creek and Mad Creek 6th field watersheds with approximately 25,800 combined acres (40 miles^2) in drainage area. All are tributary to the 4th field North Santiam River (HUC #1709000504). The Little North Fork Santiam is utilized as a drinking water source for the City of Gates and the City of Salem and thus lies within the municipal watershed. The Little North Fork Santiam 5th field watershed is a Tier 1 key watershed.

Stream Channels

The project area is situated in the Western Cascades physical province and streams reflect the geologic origin of the area[32]. Most of the terrain around the treatment units is composed of undifferentiated tuffaceious sedimentary rocks; tuffs and basalt (*Walker, 1991*). The stream channels immediately adjacent to the proposed Fawn Two treatment units are a mix of first order headwater channels with intermittent flow that converge in 2nd - 3rd order perennial channels tributary to the Fawn Creek main channel. In the Outer Limits area, the stream channels adjacent to or within the units converge in 2nd - 3rd order perennial channels tributary to Rock Creek and Madd Creek (tributary to the North Santiam river).

Intermittent channels

The small headwater tributary channels formed in the deep soils of the benches and ridges in the Fawn Two area flow intermittently on the surface before disappearing underground, only to pop

[31] Unless otherwise indicated, geographic information is an estimate derived from the BLM's GIS database.

[32] For a more detailed description of stream channel formation and geomorphology the reader is referred to ***Geomorphology of Steepland Headwaters: The Transition From Hillslopes to Channels*** (Benda *et al*., 2005).

out again down-slope. It's likely that ground water and intricate patterns of subsurface flow, as opposed to surface run-off, is the primary system of water delivery to these channels. Most are moderate gradient (4-10 percent) with small substrates (sands and gravel) reflecting the adjacent soils. Utilizing the Montgomery-Buffington typology (*Montgomery and Buffington, 1997*), these channels would be classified as colluvial: "small, headwater streams at the tips of a channel network that flow over a colluvial valley fill and exhibit weak or ephemeral fluvial transport." Most have too low of a gradient to be subject to debris torrents or landsliding.

In the Outer Limits area some of the tributaries in the project area are much steeper and potentially unstable due to channel incision into the resistant volcanic rocks. These channels are incised into resistant bedrock and subject to debris flows. They have steep side slopes that can be prone to land sliding. Due to the relatively frequent disturbance regime in these channels, some of these channels in Outer Limits are open (i.e., not fully stocked) and "brushy" with large quantities of downed wood and heavy loads of sediment in transport.

Perennial channels

Most of the perennial channels are shaded by dense stands of older conifer. Clearly wood and shade are in abundant supply, stream banks are stable and channel morphology is controlled by bedrock features with a cobble-gravel bed. These channel types are highly resilient and unlikely to be altered significantly by disturbance.

In the Fawn Two area

The small headwater tributaries adjacent to the proposed treatment units eventually reach larger perennial channels that flow to the main Fawn Creek channel. Fawn Creek has entrenched into the relatively resistant bedrock forming steep constrained valleys with steep, fragile slopes (average 60-80 percent slope). Utilizing the Montgomery-Buffington typology (*Montgomery and Buffington, 1997*), these perennial streams would be classified as step-pool channels: "Step-pool morphology generally is associated with steep gradients, small width to depth ratios, and pronounced confinement by valley walls."

In the Outer Limits area

The small headwater tributaries adjacent to the proposed Outer Limits units eventually reach larger perennial channels that flow to the main Madd Creek and Rock Creek channels. These larger 3rd order streams have entrenched into the relatively resistant bedrock forming constrained valleys with moderately steep adjacent slopes (average 50-60 percent). There is a low to moderate supply of gravel and cobble sized material actively transported in these channels. Utilizing the Montgomery-Buffington typology, these perennial streams would also be classified as step-pool channels.

Existing roads in relation to stream channels

In most locations in the project area culvert dimensions (shape, area and slope) are adequate to allow for the transport of most or all of the water, sediment and organic materials from upstream and the stream is said to be "at grade" and channel morphology upstream of the road fill is not affected. However, in other cases, the reduced area imposed by culverts and/or collapsed road beds have restricted the passage of water, sediment and organic materials from upstream resulting in the deposition of sediment above the crossing and the stream is said to be "aggraded".

The length of aggraded channel upstream of culverts will vary with channel slope and the supply of material and water, but (based on professional judgment and observation) is generally restricted to less than 100 feet on the small streams in both areas.

There are some perched culverts throughout the project area where culvert outflows erode the channel bed. Perched culverts may restrict upstream passage for aquatic organisms.

Area wetlands

There is one wetland in the NE ¼ of Section 25 of the Fawn Two area and no wetlands in Outer Limits identified on National Wetlands Inventory maps. Other wet areas are identified in BLM GIS themes. BLM personnel examined these sites and other which were not previously mapped and corrected the data to reflect these surveys. BLM personnel identified a small forested wetland in Section 17 in the Outer Limits area. All identified wetlands and areas with high water tables ("wet areas") have been excluded from treatment.

Project Area Hydrology (ACS Objective 6)

Stream Flow

During field review of project channels in both the Fawn Two and Outer Limits areas, the BLM Hydrologist did not note any evidence that would indicate channel adjustments to increased peak flows such as channel incision or bank erosion. The steep bedrock channels in the Fawn Two area are highly resistant and channel morphology generally does not adjust in response to flow increases that could result from ROS events (*Grant et. al., 2008*). The high elevation channels in this Outer Limits area are not typically subject to ROS events since they are in the snow zone. However, evidence of debris flows and large supplies of colluvial sediment in transport in these channels was frequently evident

In the Fawn Two area

There is a US Geologic Survey (USGS) gaging station several miles downstream of the project area on the Little North Fork Santiam near Mehama (#14182500) just upstream of the confluence with the North Fork Santiam main channel. The North Fork Santiam is regulated at the Detroit reservoir while the Little North Fork Santiam is free-flowing. The streams directly draining the project area have not been gauged but stream-flow is assumed to be typical of smaller Western Cascades streams where most runoff occurs during winter storm events[33]. Peak flows occur following a rapid and substantial depletion of the snow-pack during prolonged ROS in the TSZ estimated to lie between 1,500 feet and 3,000 feet elevation.

The two largest peak flow events in the recent history took place in December of 1964 and in February of 1996. Both events are estimated to be at or above a 100 year flood return interval and both were in response to substantial snow pack melt-off. Base-flow or low-flow occurs during late summer and early fall when mean stream discharge drops below 20 percent of the mean winter flow. Many small headwater channels (referred to as "intermittent" in this analysis) dry up completely during this period.

[3] For a more detailed description of watershed hydrology in forested regions of the Pacific Northwest the reader is referred to ***Physical Hydrology and the Effects of Forest Harvesting in the Pacific Northwest: A Review*** (Moore *et al*., 2005).

In the Outer Limits area

There is a USGS gaging station at similar elevations just south of the project area, at Shafer Creek near Lecomb, Oregon (http://waterdata.usgs.gov/or/nwis/uv/?site_no=14188610&PARAmeter_cd=00065,00060).

This is a small, high elevation, perennial channel that is similar to perennial streams in the project area. The gage hydrograph shows stream-flow typical of smaller Western Cascades streams where most runoff occurs during winter storm events. Peak flows occur following a rapid and substantial depletion of the snow-pack during prolonged ROS in the TSZ estimated to lie between 1,500 feet and 3,000 feet elevation. Smaller peaks occur in Schaffer Creek in late April and May during spring snowpack melt-off.

The largest peak flow event in the Schafer Creek gage history took place in February of 1996 and exceeded 400 cubic-feet/seconds (cfs). This event is estimated to be at or above a 100 year flood return interval and was in response to substantial snow pack melt-off. Base-flow or low-flow occurs during late summer and early fall when mean stream discharge drops below one cfs. Many of the small headwater channels (referred to as "intermittent" in this analysis) dry up completely during this period.

Potential for peak flow augmentation due to current conditions of forest harvest

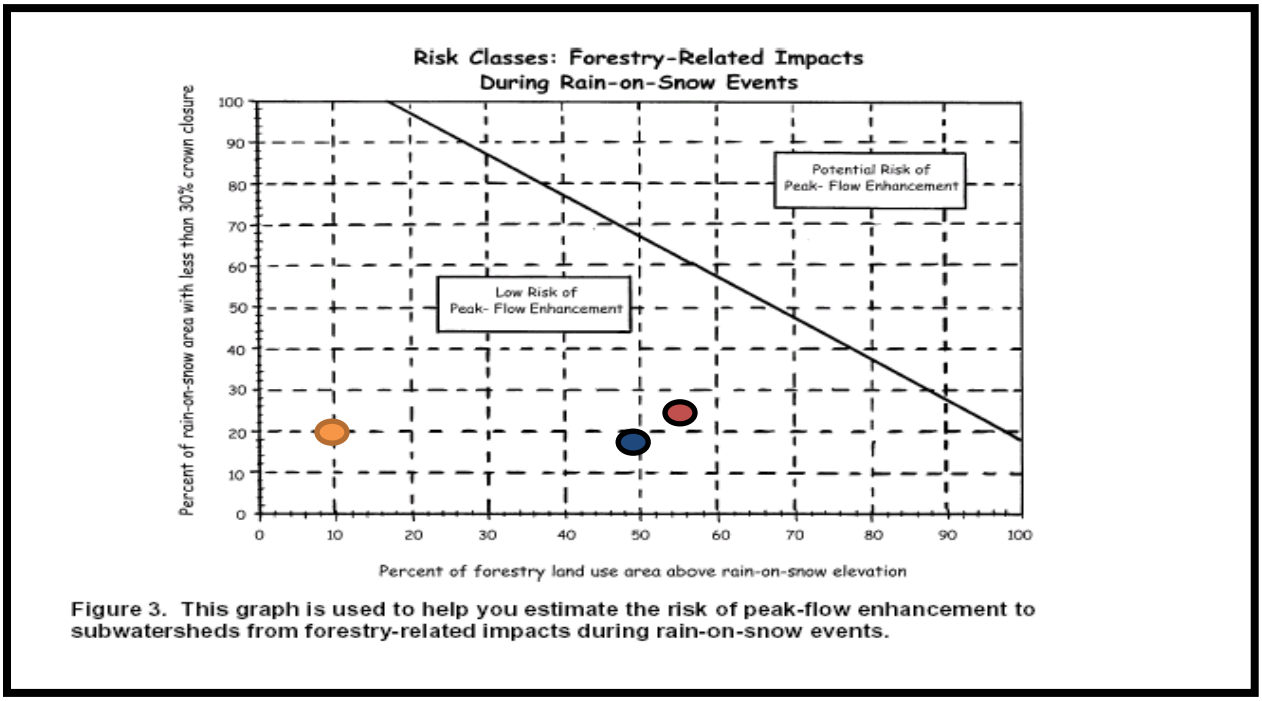
A preliminary analysis for the risk of increases in peak flow as a result of forest harvest was conducted using the Oregon Watershed Assessment Manual watershed analysis methods for forest hydrology.

Table 16 displays statistics the Elkhorn, Madd and Rock 6th field watersheds used for determining the current risk of peak flow augmentation in project watersheds (*for details of the analysis see Analytical Process for ROS Risk, memo to the EA file*). The proportion of the Elkhorn 6th field watershed (Fawn Two) in ROS is 10 percent. The risk of peak flow enhancement will vary with the proportion of this area that has been recently harvested (*see Figure 13 – orange indicator*). The proportion of ROS area with current crown closure less than 35 percent was 10 percent indicating that there is currently a low risk for peak-flow enhancement due to forest openings in the project area. The proportion of the Madd Creek and Rock Creek 6th field watersheds (Outer Limits) in ROS is 50 percent and 54 percent, respectively. The risk of peak flow enhancement will vary with the proportion of this area that has crown closure of <30 percent (*see horizontal axis, Figure 13*). At present, 12 percent and 5 percent, respectively of the ROS areas have been recently harvested, placing the watershed well below the line for "potential risk" (*see red and blue markers on Figure 13*).

Table 16. **Risk of Peak flow Enhancement by Sixth Field Watersheds in Outer Limits/Fawn Two project area.**

6th Field Subwatershed Name	Watershed Area (acres)	Percent of Watershed in ROS Areas	Percent of ROS area with <35% Current Crown Closure	Peak-Flow Enhancement Risk
Little NorthSantiam – Elkhorn Creek 6th (Fawn Two)	17,965	10% (1813 acres)	10% (194/1813 acres)	Low (Orange dot below)
Madd Creek –6th(Outer Limits)	13,531	54% (7,333 acres)	12% (916/7,333 acres)	Low (Red dot below)
Rock Creek –6th(Outer Limits)	12,259	50% (6,093 acres)	5% (305/6,093 acres)	Low (Blue dot below)

Figure 13: Graph for determining risk of peak flow augmentation in Outer Limits/Fawn Two[34].



Peak Flow/Water Quality Effects from Roads

Watersheds in the project vicinity are currently at low risk for augmentation of peak flows due to the road network because the watersheds analyzed would have only a 3-4 percent (Fawn Two) to 9-10 percent (Outer Limits) increase in stream length due to stream/road intersections. Toman (2004) and Wemple et al (*2003 "the Wemple study"*) identified roads as potential contributors to increased peak flows in the Western Cascades, acting as an "extension" of the stream network when ditches intercept water and route it directly to streams. The Wemple study indicates stream

[34] OWEB, 1997 located at http://www.oweb.state.or.us/publications/wa_manual99.shtml

drainage increases of approximately 20 percent or greater (indicated by Figure 14) have the capacity to alter the timing and quantity of peak flows on a watershed scale.

As a surrogate for risk, the increase in drainage density due to road/stream intersections was calculated for the two 7th field watersheds in the Fawn Two area and two 6th field watersheds in the Outer Limits area. Stream/road intersections were counted in GIS and the total multiplied by. Figures 15 and 16 display estimated channel network expansion due to road-stream intersections for project watersheds; assuming a 200 foot increase in length/road intersection in the Outer Limits area and a 100 foot increase in the Fawn Two area.

Figure 14: Estimated channel network expansion at road-stream intersections for project 7th field watersheds in the Fawn Two area. Data was estimated utilizing the Salem ARC-GIS.

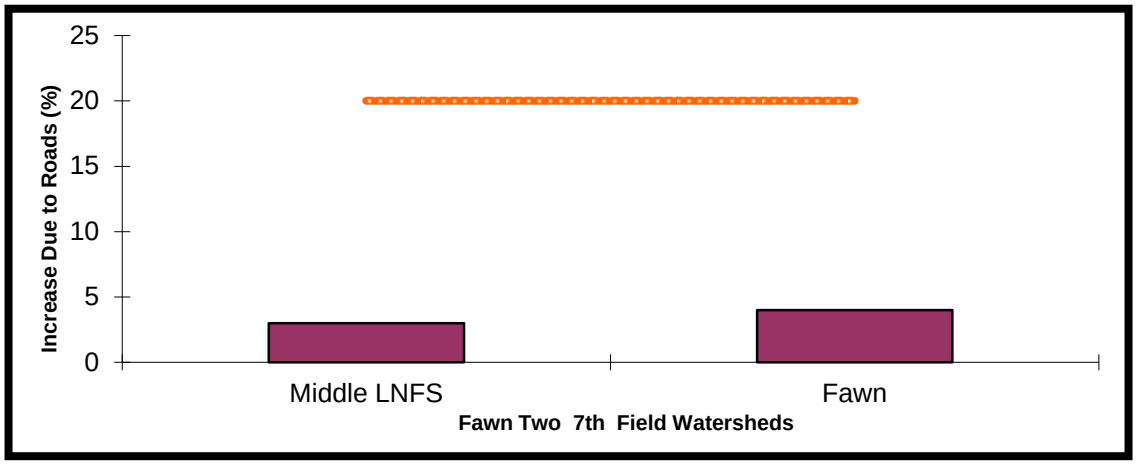
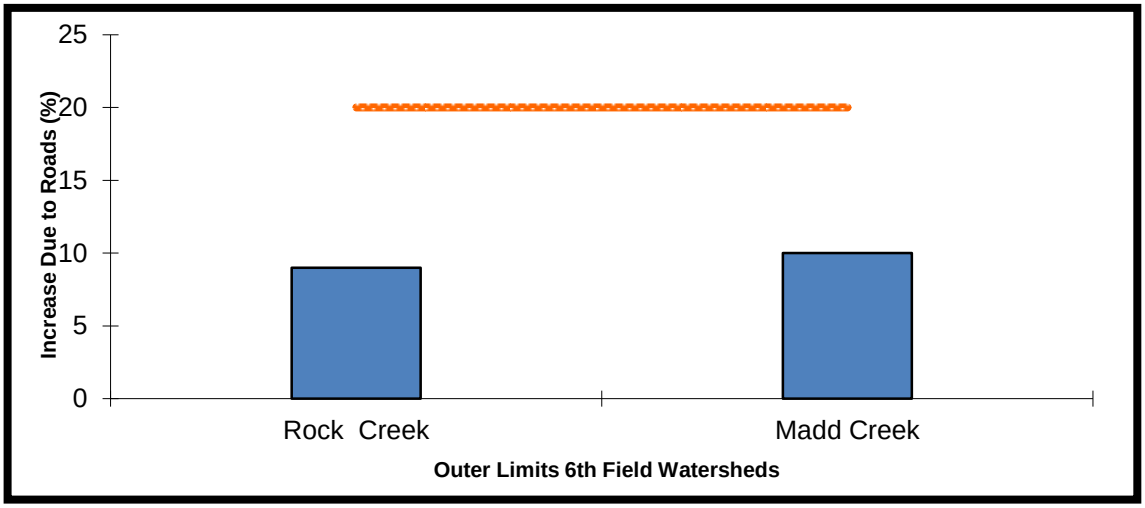


Figure 15: Estimated channel network expansion at road-stream intersections for project 6th field watersheds in the Outer Limits area. Data was estimated utilizing the Salem ARC-GIS.



Streams near to roads are also at higher risk for water quality contamination from material washed off the road surface and for increased stream temperature as a result of reductions in streamside shading. During storms, runoff from unpaved forest roads may deliver sediment to streams resulting in increased sediment transport, deposition of fines in gravels and turbidity levels that exceed natural background levels (*Beschta, 1978; Binkley and Brown, 1993*).

Roads in the project area were inspected by the Cascade RA engineers and hydrologist. Most road surfaces are well maintained and in good condition with little potential to contribute fine sediment to area streams. During wet weather and exposure to truck traffic fine sediment in these roads can be "pumped" to the surface where it is available to be washed off into local streams. Road surfaces that are drained directly to local streams (i.e., connected) have the potential to raise turbidity levels and the supply of fine sediment. Road segments with potential water quality problems have been identified and will be repaired before haul.

Project area ground water

The ODEQ has not identified any groundwater pollution problems within project watersheds. The Oregon Water Resources Department (OWRD), together with the ODEQ is responsible for the regulation and protection of ground water quality and quantity in Oregon.

Local conditions of groundwater relative to quantity, location, flow and quality is understood only in a general sense. In the forested uplands, water that drains from the soil profile quickly moves along preferred pathways in the subsurface either to emerge again down-slope as a "spring," become trapped in subsurface storage, or infiltrate deeply into the watershed aquifer. Thus, the forested uplands are groundwater "recharge" zones: the surface and subsurface conditions in headwaters ultimately may influence the quantity and quality of groundwater in the valleys below. In forested uplands, shallow ground water levels fluctuate in response to seasonal patterns of precipitation. Interaction between surface flow and subsurface flow is intricate and varies across the landscape in response to conditions in soils, topography and lithology.

The soils in the project area have infiltration rates between 0.25 - 2 inches/hour. Under natural conditions, most precipitation either drains through the soil profile or is transpired by vegetation rather than becoming surface runoff.

Areas of existing compaction do not have an identifiable effect on overall infiltration or groundwater in the project area because these compacted areas are generally scattered and at different stages of recovery. It is expected precipitation in compacted areas will puddle near the soil surface, free to either transpire, evaporate or runoff and infiltrate adjacent vegetated areas.

Forest roads and landings can intersect ground water and reroute it to surface streams, which can alter patterns of subsurface flow. This conversion of ground water to surface run-off can alter the timing and size of peak flows and result in a proportionate reduction in water available for ground water storage (*see the previous discussion* "*Peak Flow/Water Quality Effects from Roads").*

Local lithology also dictates the quality of groundwater and, by extension, sets the base conditions for the quality of surface water. Water in Western Cascades volcanic materials is typically low in dissolved salts and nutrients with a slightly acidic pH. Temperature is a function of the soil and subsurface temperatures which vary only slightly throughout the year, hovering between 8-15 degrees Celsius for Fawn Two and 5-10 degrees Celsius for Outer Limits.

Water Quality and Beneficial Uses

The ODEQ, under the Clean Water Act, has been delegated authority to protect the quality of all waters in the State of Oregon. Established water quality standards "not to be exceeded" for all waters of the state are published in the Oregon Administrative Rules, Chapter 340, Division 41. In addition, updated water quality standards have recently been approved by the US Environmental Protection Agency (USEPA).[35]

Designated Beneficial Uses and Water Rights

The State of Oregon designates the beneficial uses for which all waters of the state are utilized. Water quality standards are ultimately meant to protect these uses. Some of the site specific uses of surface water from the project area are displayed in Table 17.

Table 17. **Beneficial uses associated with streams in the project area.**

Stream (Watershed) Project Action	Beneficial Use	Information Source
Little North Santiam (Santiam Basin) - ***Fawn Two*** Little North Santiam /Madd and Rock Creek (Santiam Basin) – ***Outer Limits*** Timber harvest: regeneration harvest, road construction and reconstruction, log hauling	Salmon rearing and spawning	Downstream from project area. See fisheries report.
	Resident fish and aquatic life	Adjacent to some project units on perennial streams and some tributaries: see fisheries report.
	Irrigation and Domestic Drinking Water	Downstream from most units. See WRIS.
	Municipal Drinking Water	Intake in Lower North Santiam: source water assessment

Source: WRIS = Water Rights Information System of the Oregon Department of Water Resource: http://www.wrd.state.or.us/OWRD/WR/index.shtml

Both resident and anadromous fish are downstream from several of the proposed units (*see EA Section 3.3.3, Fisheries).* Additional beneficial uses include: Industrial Water Supply, Wildlife and Hunting, Fishing, Boating, Anadromous Fish Passage, Water Contact Recreation, and Aesthetic Quality[36].

Municipal Water Providers and Source Water Assessments

In the Fawn Two area, several municipal water providers withdraw water from the Lower North Santiam to treat and provide city residents with drinking water. The City of Salem Public Works (PWS# 4100731), Mill City Water Department (PWS #4100520), City of Gates (PWS# 4100317) and the Lyons Mehama Water District (PWS #4100493) and Stayton Water Supply (PWS# 4100843) have withdrawals downstream of the project area.

In the Outer Limits area, the City of Jefferson withdraws water from the Lower North Santiam to treat and provide city residents with drinking water[37]. The source water assessment identified 61

[35] These standards may be reviewed at http://www.deq.state.or.us/wq/standards/Temperature/FinalRules340-041.pdf

[36] Designated beneficial uses for the Willamette may be viewed on-line at: http://www.deq.state.or.us/wq/standards/uses.htm.

[37] A Source Water Assessment for each provider is available on-line at: http://www.deq.state.or.us/wq/dwp/swrpts.asp.

potential sources of contamination within the watershed; forestry related activities (road building, harvest, etc.) were cited once as a potential source of sediment due to surface erosion. In addition to withdrawals for municipal water consumption, there are withdrawals downstream of the project area for domestic use, irrigation and livestock watering.

Water Quality Limited Streams

The ODEQ's 2010 Integrated Report[38] on surface water quality is a database compilation of streams which do not meet the state of Oregon's water quality standards. The North Santiam River and its tributaries (e.g., Madd Creek and Rock Creek) are all listed as not meeting water quality standards for summer stream temperatures. In response, the ODEQ has developed a Total Maximum Daily Load (TMDL) for the Willamette basin. As part of the TMDL, the BLM submitted the Salem and Eugene District Water Quality Restoration Plan (WQRP) for the Willamette Basin which details how the BLM will implement the TMDL on federal lands. The plan was approved by the ODEQ on July 18, 2008.

The water quality parameters with the potential to be affected by forest harvest and road construction and maintenance include stream temperature, dissolved oxygen (DO) concentrations (both inter-gravel and in water), hydrogen ion concentration (pH), and turbidity. Additional water quality parameters (e.g., nutrients, pesticide and herbicide residues, bacteria, etc.) are not highly sensitive to forest harvest and road construction (*USEPA, 1991*) and were not reviewed for this analysis.

Stream Temperature

Limited stream temperature data in the project area was located for this assessment. The Little North Santiam Watershed Analysis indicated that summer stream temperatures on the main channel of Little North Fork Santiam downstream of the project area (i.e., below Polly Creek) were found to be above the State of Oregon's threshold of 17.8° C. The North Santiam River Watershed Analysis indicated (*Page 6-19*) that stream temperatures on the North Santiam exceeded the state standards at 14 of 15 sites, including the outlet of Stout Creek below the project area. The watershed analysis also indicated that the openings in the canopy along portions of the main channel might be contributing to increased stream temperatures. Crown closure is less than 35 percent adjacent to large portions of the main channel and many tributaries in the watershed, particularly on private land.

Field surveys and review of aerial photographs indicate that shading is near to full potential along most of the small streams on BLM lands in the project area with canopy closure exceeding 80 percent along most reaches. In the Outer Limits area, some of the riparian forest is of high stand density with these areas proposed for thinning. In addition, many of the tributaries adjacent to the proposed treatment units in Outer Limits are intermittent and only flow during the wet season when exposure to solar heating is of low concern.

Sediment Supply, Transport and Turbidity

Mass wasting

The project vicinity was field reviewed for mass wasting potential. Mass wasting is the primary process responsible for the bulk of sediment production and transport in mountainous terrain. It

[38] http://www.deq.state.or.us/wq/assessment/2010Report.htm

is critical to recognize that sediment transport in headwater basins is dominated by highly episodic, large erosion events. 64 percent of the suspended sediment transport in the Little North Fork Santiam for the entire year of 2004 occurred in a single three day storm event North Santiam River Basin Turbidity and Suspended-Sediment Study [39]. This is not atypical and therefore, short term approaches to understanding, measuring, studying and quantifying sediment transport and yield are likely to miss the most important events.

Surface erosion, stream bank and channel erosion

Soil surface run-off or overland flow (water moving over the surface with the energy to erode soil) is rarely observed on forest slopes (*Leopold, 1997*). Due to the high infiltration capacity of native soils, heavy vegetative growth and deep layers of surface organic material (i.e., soil duff-layer), surface erosion on undisturbed forested land in the project area is rare.

Unusual levels of stream bank and channel erosion were not observed in field surveys of streams in the project vicinity. Stream bank erosion and channel cutting (horizontal or lateral) may be accelerated by reductions in channel roughness or resistance, increases in stream energy (e.g., stream power) or the redirection of stream-flow (*Lane, 1955*).

Channel roughness is altered by the direct removal or placement of material into channels or alteration of stream power (a measure of the ability of a stream to erode and transport sediment). Historically, channel roughness throughout forested regions in Western Oregon was quite high due to large quantities of wood in channels and the activities of beaver. Size and distribution of sediment in the channel bed and banks is a second important element of channel roughness and this is directly related to episodic mass wasting. Streams in the project area appear to have moderate levels of wood in place with well vegetated banks.

Stream power increases with higher peak flows and with narrowing or increasing the gradient of a channel such as may occur when a culvert is installed, which could increase the rates of ban and/or channel erosion. Indicators of increased stream flow (relative to historic ranges) in project area streams were not noted during field surveys. Channel adjustments at culverts were within the range expected for these channel types.

Turbidity and Sediment

During the 1996 flood high levels of persistent turbidity in the North Santiam became an issue for the City of Salem water supply (diverted from the North Santiam near Stayton, Oregon). Investigations revealed that smectite clays associated with naturally occurring, deep seated rotation earth flows are the likely source for fine sediments which result in elevated turbidities on the North Santiam[40]. According to the document, turbidity from the Little North Fork Santiam impacts the Salem water intake initially during high flows but is not persistent. Recommendations from this study, when appropriate, are incorporated into project proposals.

No landslides or turbidity source areas have been identified in Fawn Creek (Fawn Two area) or in the streams associated with the Outer Limits area. A follow-up study of turbidity is ongoing which includes continuous turbidity monitoring at several sites in the North Santiam, including

[39] http://or.water.usgs.gov/proj/or00311/index.html

[40] see http://www.watershed.org/news/fall_98/1_turbidity_study.html

Evans Creek, which is near, but not directly associated with the Fawn Two area. The study is led by the USGS. in cooperation with the City of Salem and the USFS (*see Mass wasting section*).

3.3.2.2 Environmental Effects

Proposed Action

Channel and Wetland Morphology (ACS Objective 3)

Direct and Indirect Effects

In general, there would be no direct alteration of the physical features of project area stream channels or wetlands under this proposal. Stream banks, channel beds and wetlands are protected with no entry buffers (i.e., SPZs) from direct physical alteration or disturbance by harvesting equipment. With the exception of the proposed restoration of stream crossings (discussed below) direct disturbances by equipment or yarding are kept out of SPZs.

In addition, the Proposed Action is unlikely to affect stream flow and therefore any indirect effects to stream channels as a result of flow alteration or timing is unlikely. Thus, the Proposed Action would not result in detectable effects to channel morphology, such as increases in bank erosion, channel incision, scouring of substrates or gravel deposits utilized by fish for spawning, loss of floodplain connectivity or alteration of local wetland hydrology that could result from augmented peak flows or altered watershed hydrology.

New road construction would not cross stream channels or wetlands, however, work at stream crossings that have not been maintained is proposed in the Outer Limits area (*see EA Section 2.3.1, Table 4*). No work at stream crossings is proposed in the Fawn Two area.

Twelve culverts would be installed or replaced on stream crossings on roads accessing units in the Outer Limits area in Section 29 and on road 10-4E-28.2, which may potentially be used to haul gravel from a USFS gravel pit. Two additional cross-drain culverts would also be installed on these roads and replacement of these culverts would provide improved stream flow and passage of sediment, organic materials and aquatic organisms and will eliminate the chronic erosion and turbidity at these sites. Some slight channel adjustment to grade or width may occur within the first year (varies with the timing and magnitude of storm events) following disturbance as the channel reaches equilibrium with flow and sediment transport. Based on previous experience with these type of channel crossings (i.e., judgment of the BLM hydrologist) long term effects to channel function or morphology from disturbance at these sites would be unlikely because the channels resist change and would adjust to accommodate the disturbance without creating bed or bank instability. Channel morphology adjustments would be unlikely to extend more than 100 feet upstream or downstream from the site of disturbance.

Cumulative Effects – Channel and Wetland Morphology

With the exception of disturbance to the channel at the culvert replacement sites in the Outer Limits area this Proposed Action would not result in any direct effects to channel or wetland morphology and therefore would have no cumulative effect. At the locations of direct channel disturbance, adjustments would be limited to the site of disturbance (i.e., not extend more than 100 feet downstream or upstream from the disturbance) and would not result in alterations to channels or floodplains downstream or elsewhere in the watersheds. Channel adjustments at the site of disturbance, if they occur at all, would be of relatively low magnitude and short duration

(channel adjustment within one year). Finally, since channels in the project area already have properly functioning dimensions and form there is no cumulative effect to contribute to.

Project Area Hydrology (ACS Objective 6)

Mean Annual Water Yield

This proposal would likely result in a slight incremental increase in annual water yield correlated to the removal of the conifer over-story (*Troendle et al., 2006*). However, other than the augmentation of peak and/or base flows (discussed below) the "increase in fall and winter discharge from forest activities is likely to have little biological or physical significance" (*USEPA, 1991*). Increases in mean annual water yield[41] following the removal of watershed vegetation have been documented in numerous studies around the world (*Bosch et al., 1982*). Forest vegetation intercepts precipitation and through the processes of sublimation (the direct conversion of snow from a solid to a gas w/o entering a liquid phase) and/or evapo-transpiration, the forest returns to the atmosphere over 50 percent of the annual precipitation that might otherwise become runoff.

Base flow and fog-drip

The potential increase in mean annual water yield may result in a slight increase in base flow (low summer flow) (*MacDonald, 1991*). No studies have been located for this analysis to indicate that fog drip is a large contributor to stream flow in the project area.

Peak Flows

In the Fawn Two area, the Proposed Action would not increase openings (areas greater than 30 percent canopy closure) within the TSZ in the project watersheds. Since canopy closure will remain over 30 percent in the Proposed Action, the increase in snow accumulation and melt-off during ROS events would remain below a level likely to result in measurable increases in peak flows according to the State of Oregon risk assessment methodology.

In the Outer Limits area, the units are in the snow zone (*see EA Section 3.3.2.2*) and ROS events are less likely at these high elevations. In addition, the watersheds for the project area are well within the range of "low risk" for increase in peak flows (*see EA Figures 13,14*).

Groundwater

The Proposed Action is unlikely to affect peak or base flow and so, by extension, it has little capacity to affect groundwater patterns which are intimately linked to the surface. Compacted surfaces will be limited to less than 10 to 12 percent of the project area and will partially coincide with existing compacted surfaces. New road construction is unlikely to intersect ground water flow. These surfaces are located on topography with low to moderate slope so water that does not infiltrate here will either be evapo-transpired or will infiltrate quickly into adjacent soils that are not compacted.

Cumulative Effects – Area Hydrology

The Proposed Action carries no risk for contributing to any existing cumulative effects to watershed hydrology because the watersheds are currently at a low risk for impacts and there would not be any detectable direct or indirect effects to the watershed's surface flows or ground

[41] The total yield of water from a watershed in one year averaged across the period of record.

water. Since there would not be any direct or indirect effect to the watershed's ground water, the Proposed Action carries no risk for contributing to any existing cumulative effects to this resource.

Water Quality (ACS Objective 4)

Direct and Indirect Effects

Summer Stream Temperature Maximums in Perennial Streams

The Proposed Action would not result in any detectable change in stream temperature, stream temperatures would remain in their current range and would protect beneficial uses. The streams are all currently well shaded and the project would maintain that shade by maintaining SPZ where there is no removal of any vegetation from the primary shade zones. The project meets or exceeds the requirements of the Northwest Forest Plan Temperature TMDL Implementation Strategies (*USFS and BLM 2004*) designed to protect summer stream temperatures by maintaining shade. Wilkerson, et al. (2005) and Groom, et al (2011) found that similar or less (maintaining 25 percent density to within 25 feet of streams) shade retention resulted in no detectable changes in stream temperature.

Summer Stream Temperature Maximums in Intermittent Streams

The Proposed Action would be unlikely to result in any measurable alteration of temperature regime in intermittent streams in the project area because water does not flow on the surface during most summers so water is not exposed to direct solar radiation. Water temperature is influence directly by soil temperature, which is primarily a function of elevation, aspect and soil type. These streams are further protect by SPZ, which maintains shade, even though reducing stand density near the streams would be unlikely to result in increased water temperature.

Dissolved Oxygen (DO) pH and Conductivity

It is unlikely the Proposed Action would have any measurable effect on DO levels in the project area streams. Increase in temperature, sedimentation, fine organic material or reductions in re-aeration that reduce DO are unlikely in small forested streams (*Hall and Lantz, 1969*). Available data indicates that most forest management activities have little effect on pH or conductivity (*USEPA, 1991*).

Turbidity

Road construction and maintenance

All new road construction would occur on low to moderate slopes emanating from the existing road network, on stable surfaces and therefore road related landslides in these locations are unlikely. New roads would not be connected to the stream system and therefore no pathway would exist for delivery of fine sediment which could increase turbidity in streams.

Road maintenance and improvement, including culvert replacement, would not likely exceed the standards for increased turbidity (visible reduction in water clarity) set by the State of Oregon, which would maintain water quality standards and protect beneficial uses in streams in the project vicinity.

Replacement of stream crossing culverts and removal of the blocked and eroding culverts would occur during the driest period of the year, the "in-water work period," to avoid increasing turbidity of local streams during periods of higher flow. A turbidity plume downstream from the

disturbance may be visible during the actual replacement which would be unlikely to exceed ODEQ water standards beyond the mixing zone of approximately 100 meters downstream; it would likely decrease by an order of magnitude within two hours after disturbance ceases (*Foltz and Yanosek, 2005).* In-stream disturbance at these sites would probably be completed during one work day so any increase in turbidity would be unlikely to exceed eight hours.

There may be increase turbidity relative to background or upstream water clarity during the first winter following the project if storm events wash some of the fines off surfaces disturbed by road maintenance actions and deliver them to the stream. Any increased turbidity would be unlikely to be visible or detectable beyond 800 meters below the site of the disturbance (*Foltz and Yanosek, 2005),* would not likely exceed the standards set by the State of Oregon.

To further reduce potential increases in turbidity, BLM staff would visually monitor turbidity as required by State of Oregon during in-channel work at these sites. If Oregon State Standards were exceeded anytime, BLM would stop all in-stream activities and require the contractor to take appropriate steps to reduce turbidity to acceptable levels.

Hauling

Increases in turbidity attributable to hauling would be unlikely to exceed the State of Oregon water quality standards (greater than 10 percent increase relative to background levels). Increased turbidity as a result of hauling is unlikely to be visible or detectable beyond 800 meters below the site of the disturbance (*Foltz and Yanosek, 2005*), would not exceed the State of Oregon's Water Quality (WQ) standards because:

- BLM would contractually require the operator to prevent road-generated fine sediment runoff from reaching streams in amounts which would exceed ODEQ water quality standards. Commonly used methods include (but are not limited to): adding rock to the road and re-grading of the road surface to improve drainage, creating sediment traps and timing haul to avoid general sediment.
- BLM personnel would visually monitor the road network and turbidity levels at road/stream intersections during wet season/wet weather hauling. If water clarity is visibly altered below the mixing zone it will be assumed that it is approaching limits set by the ODEQ and BLM would require the operator to immediately implement measures to reduce fine sediment run-off into the stream and/or suspend hauling.

Cumulative Effects – Water Quality

The Proposed Action is unlikely to have any measurable direct or indirect effect on stream temperatures, pH, or dissolved oxygen. Current conditions and trends in water quality would likely be maintained under the all alternatives. Therefore, proposed action has little potential for contributing to any cumulative effects to these water quality attributes in these watersheds.

The risk of short term (during the action and the first winter following) increases in stream turbidity as a result of winter haul, road repair and maintenance may contribute to increased turbidity levels directly below road/stream intersections (i.e., direct effect). These would be maintained below the limits required by the O DEQ. Cumulatively the limited extent (not visible more than 800 meters downstream of the crossing), magnitude (less than 10 percent of upstream turbidity levels) and duration (primarily during heavy rainfall events in the first winter following

road repairs) of this effect would be non-detectable on the scale of the 6th field watershed and would be unlikely to contribute cumulatively to turbidity levels in project watersheds.

Sediment Regime (ACS Objective 5)

Forest Management Practices

Forest management practices which could potentially accelerate erosion and sediment supply to streams include: road construction/maintenance, truck hauling of harvested material across unpaved forest roads, harvest operations including falling and yarding, and prescribed burning for site preparation.

The Proposed Action would not increase bank erosion or channel cutting by altering channel roughness, redirecting flows or altering bank-stabilizing vegetation. The potential for increases in stream energy due to alterations of peak flows is low, as no tree falling yarding into or through streams is not proposed, and the SPZs would eliminate most disturbance of stream-side vegetation.

Increases in sediment delivery to streams due to mass wasting induced by loss of root strength and increases in soil pore pressure are unlikely because areas with potential for slope instability and mass wasting were identified and verified by BLM personnel and excluded from the project.

Harvest operations would not increase sediment supply to streams because:

- SPZs on all streams would act to protect banks and filter overland flow or sediment. The effectiveness of SPZ for protecting water quality in forestry operations has been demonstrated in research studies around the world (*Norris, 1993*).
- Water would normally infiltrate rather than run off and erode soil because forest cover would be retained with at least 50 percent canopy closure in Riparian Reserves (where treated) in addition to the undisturbed vegetation in SPZ.
- BLM field review of skyline yarded units during intense rainstorm events from 2007-2012 found no evidence of overland flow or sediment transport where erosion models had predicted sediment transport under similar conditions (*Hawe, 2012*).
- BLM personnel monitor harvest operations and would require operators to implement sufficient measures to reduce potential sediment transport to below detectable levels.

Cumulative Effects - Sediment

Since there would be no detectable increase in sediment supply or transport as a result of the Proposed Action, there is no possibility to contribute to cumulative effects.

Fuels Treatment

Pile or broadcast burning would be unlikely to have any influence over water quality, stream channels or watershed hydrology and any effects to soils and hydrology would be short term and limited to the immediate site because the areas to be burned would be located outside of SPZs so there is no delivery mechanism by which ash or soil from the burn locations could reach stream channels. Other fuel treatment methods (e.g. lop and scatter, mastication) do not create ash or erosion, so none could be introduced into streams.

Alternative Action

The Alternative Action would leave additional forest cover on treatment units but would not alter any other factor (i.e. connected actions). Since the forest cover retained under the Proposed Action is already adequate to protect stream channels, watershed hydrology and water quality, the Alternative Action, if implemented, would show no measurable difference in effects to these resources.

No Action Alternative

Under the No Action Alternative, the existing water quality conditions, stream flows, and channel conditions at the project site would continue their current trends.

3.3.3 Fisheries and Aquatic Habitat

Sources: *Outer Limits and Fawn Two Fisheries Specialist Report (Fisheries Report, Zoellick, 2015; Hydrology/Channels/Water Quality: Specialist Report s for the Outer Limits and Fawn Two areas (Hydrology Report) Hawe, 2015; Outer Limits/Fawn Two Logging Systems Report, Bernards, 2015;*

Methodology:

- BLM Cascades RA Fisheries Biologist conducted surveys to determine resident fish distribution. Survey methods commonly used include data in State and Federal records, field surveys of channel and stream habitat characteristics including barriers to fish passage, electrofishing, and snorkel surveys of project area streams. Fish presence and habitat surveys for the Outer Limits/Fawn Two project were conducted in May of 2014.
- BLM Cascades RA civil engineering staff, logging systems specialist, fisheries biologist and hydrologist examined locations and conditions of existing culverts, proposed stream crossings, and log hauling roads and various times during 2014 and 2015.

3.3.3.1 Affected Environment

Fish and Aquatic Species: Presence and Habitat in the Project Area

Resident Fish

In the Fawn Two area, coastal cutthroat trout (*Oncorhynchus clarki clarki*; Behnke 1992) are common in Fawn Creek and an unnamed 3rd order tributary stream to the Little North Santiam River. These two streams are located to the east and west of Units 25A and 25B. No 1st or 2nd order tributary streams located in or adjacent to units 25A and 25B support fish populations. These streams either have too small of surface flows to support fish populations, or are located upstream of steep gradient channels that prevent fish access.

Cutthroat trout are also common in the Little North Santiam River. Other resident fish known to inhabit the Little North Fork Santiam River include longnose dace (*Rhinichthys cataractae*), resident rainbow trout (*O. mykiss*), and mountain whitefish (*Prosopium williamsoni*; USBLM 1997).

In the Outer Limits area, rainbow trout (*Oncorhynchus mykiss*) are common in East Fork Rock and Rock creeks and an unnamed 3rd order tributary stream to Rock Creek. Rock Creek and its 3rd order tributary are located in the proposed units in Section 29. East Fork Rock Creek is located adjacent to the west of unit 17B in the SE ¼ of Section 17. Several 1st order tributaries drain from unit 17A to Madd Creek. No 1st or 2nd order tributary streams located in or adjacent

to the units in Sections 17 and 29 support fish populations. These streams either have too small of surface flows to support fish populations, or are located upstream of steep gradient channels that prevent fish access.

Madd, East Fork Rock, and Rock creeks are tributaries to the North Santiam River. Native resident fish known to inhabit the North Santiam River include rainbow trout, cutthroat trout (*O. clarki clarki*), Pacific lamprey (*Lampetra tridentata*), mountain whitefish (*Prosopium williamsoni*), redside shiner (*Richardsonius balteatus*), northern pikeminnow (*Ptychocheilus oregonensis*), Oregon chub (*Oregonichthys crameri*), threespine stickleback (*Gasterosteus aculeatus*), sandroller (*Percopsis transmontana*), largescale sucker (*Catostomus macrocheilus*), longnose dace (*Rhinichthys cataractae),* and several species of sculpins *(Cottus spp.; E & S Environmental Chemistry, Inc. 2002*).

Aquatic Habitat and Species

In the Fawn Two area, stream channels in the project area are stable due to vegetation (substrates are generally silt or gravel dominated; *BLM Fish Inventories 2013*), well-shaded (greater than 90 percent effective shading; *BLM Fish Inventories 2013*), and stream banks are stable (greater than 90 percent of banks vegetated with riparian and streamside vegetation; *BLM Fish Inventories 2013*).

The Little North Santiam River adjacent to the project area flows through a moderately confined valley (gradients of 2-4 percent; Rosgen C-channel type; *Rosgen 1994*) with local areas of wider floodplains and riffle-pool channels (Rosgen C-channel type; *Rosgen 1994*). Tributary streams to the Little North Fork Santiam River, including Fawn Creek, drop steeply to the river with gradients of 5 to 20 percent.

In-stream habitats of Fawn Creek and the Little North Santiam River are rated in fair to good condition (*BLM 1997*). Pool frequency and area is generally good in the Little North Santiam, but large woody debris (LW) levels are low. Conversely, pool frequency and area are poor in Fawn Creek. LW amounts and recruitment potential are good to excellent in the 1 mile reach of Fawn Creek immediately adjacent to the project units.

In-stream habitats of Madd and Rock creeks in the vicinity of the Outer Limits area are generally in undesirable condition (*E & S Environmental Chemistry, Inc. 2002*). Frequency of pools in most reaches is less than that of potential natural conditions, and large wood levels are low. Except for the BLM-managed portion of Rock Creek, riparian forest stand are young-aged with little potential to contribute LW to channels in both Rock and Madd Creeks. Similarly, stream shade levels are low to moderate on about one-half the length of the two streams (*E & S Environmental Chemistry, Inc., 2002*).

Pacific giant (*Dicamptodon tenebrosus*) and torrent salamanders (*Rhyacotriton cascadae*), and tailed frogs (*Ascaphus truei*) are abundant in the headwaters of Rock Creek in Section 29, upstream of the stream segments inhabited by rainbow trout. Torrent and Pacific giant salamanders also inhabit most of the 1st and 2nd order tributaries in the Section 29 units draining to Rock Creek.

Threatened and Endangered Species

Upper Willamette River (UWR) Winter run steelhead trout (*O. mykiss*), and UWR spring Chinook salmon (*O. tshawytscha*) are listed as 'threatened' under the Endangered Species Act of 1973 (ESA). Salmon and steelhead populations in the Upper Willamette River evolutionary

significant unit (ESU) are substantially reproductively isolated from other populations and are an important component in the evolutionary legacy of those species (*NOAA 2005*). The Little North Santiam and North Santiam Rivers are in the Santiam River subbasin of the Upper Willamette River ESU. Winter Steelhead and Chinook salmon inhabit the Little North and North Santiam Rivers in the vicinity of the project area.

Spring Chinook salmon and Winter steelhead trout are distributed the length of the North Santiam River upstream to Big Cliff Dam, near the town of Gates (T.9S, R.4E, Section 35; *Streamnet 2014*), and inhabit the Little North Santiam River from its confluence with the North Santiam River upstream to a barrier falls near the Stack Creek confluence (T.8S, R.4E, Section 26; *Streamnet 2014*). Winter steelhead and spring Chinook populations also inhabit Madd Creek and Rock Creek in the vicinity of the project area. All timber harvest units are located 0.7 to 4.5 miles upstream of listed fish habitat (*see Table 18*).

Table 18. **Distances from proposed units downstream to resident cutthroat trout and ESA listed fish habitat**

Unit Number	Distance to Resident Cutthroat Trout Habitat	Distance to ESA Listed Fish Species Habitat	
		Steelhead trout	Chinook salmon
17A	0.75 Miles to Madd Creek	2.7	3.9
17A	0.2 Mile to East Fork or Rock Creek	3.4	4.1
17B	2.0 Miles to Madd Creek	3.3	4.5
17B	0.1 miles to East Fork Rock Creek	3.9	4.1
All Units in Section 29	70 to 80 feet to Rock Creek	3.6	4.3
25A	480 feet to unnamed tributary	1.4	1.4
25A	480 feet to Fawn Creek	0.7	0.7
25B	480 feet to unnamed tributary	1.2	1.2

3.3.3.2 Environmental Effects

Proposed Action

Resident Fish and Aquatic Habitats (ACS Objectives 2,3,8)

Stream Channels

Regeneration tree harvest would not impact channel conditions and fish habitat due to no-disturbance buffer widths SPZs equal to one potential tree height (approximately 240 feet in Fawn Two) on streams without fish populations, and equal to two potential tree heights (approximately 480 feet) on streams supporting fish populations. These SPZ widths are more than adequate to intercept and infiltrate water carrying sediment preventing its delivery to streams and aquatic habitats (*Olson and Rugger 2007, Rashin et al. 2006, CH2MHILL et al. 1999).*

Proposed tree thinning would not impact channel conditions and fish habitat due to minimum no-disturbance buffers SPZs of 70 feet on perennial streams, and 30 feet on intermittent 1st and 2nd order headwater tributaries. A portion of unit 17A would have regeneration harvest (leave 16 to 18 trees per acre). Streams in this unit would have SPZ widths of 140 to 200 feet. These SPZs widths are adequate to intercept and infiltrate water carrying sediment preventing its delivery to streams and aquatic habitats (*Olson and Rugger 2007, Rashin et al. 2006, CH2MHILL et al. 1999).*

Stream Shading and Temperature

In the Fawn Two area, streams supporting fish populations would have two site-potential tree height no-disturbance buffers (approximately 480 feet on both sides of the stream), and all other streams would have one site potential tree height no-entry buffers (approximately 240 feet on both sides of the stream). Thus, with no disturbance to the primary shade and secondary shade zones, no change in solar radiation input and stream temperature would occur (*BLM TMDL Implementation Strategy; Groom et al. 2011*).

In the Outer Limits area, perennial streams supporting fish populations, including Rock Creek and a 3rd order tributary, would have minimum 70 foot wide no-disturbance buffers, and perennial tributaries to Rock Creek, and east fork of Rock Creek would also have minimum 70 to 85 foot wide no-entry buffers. Tributaries to Madd Creek in unit 17A would have 140-200 foot wide no-entry buffers. Thus, with no disturbance to the primary shade zone (within 70 to 85 feet of channels), and retaining a minimum of 50 percent canopy closure in the secondary shade zone, no change in solar radiation input and stream temperature would occur (*BLM TMDL Implementation Strategy; Groom et al. 2011*). Trees would be thinned in Riparian Reserve up to 30 feet from intermittent headwater tributary streams. These streams would not have surface flows during the summer, thus summer stream temperatures would not be altered.

Large Wood (LW)

Regeneration harvest within one site tree height of all streams would result in no change to tree growth rates in the Riparian Reserve and on change to LW availability to associated streams. Thinning in the Riparian Reserve would result in faster tree growth rates and an increase in LW availability to the streams over the long term.

Sediment and Roads

Little if any sediment produced by new/renovated/improved road surfaces would be likely to reach stream channels and would not impact aquatic habitats or fish populations for the following reasons: New roads are located greater than 200 feet from stream channels, and would be located and designed as to not increase the size of the stream network. New roads (a total of approximately 0.56 miles) would be located on gentle to moderate slopes, and all roads constructed/renovated/improved would be designed to drain surface water to adjacent stable, vegetated slopes where it would infiltrate and not deliver sediment to any stream.

Twelve culverts would be installed or replaced on stream crossings on roads accessing units in the Outer Limits area in Section 29 and on road 10-4E-28.2, which may potentially be used to haul gravel from a USFS gravel pit. Two additional cross-drain culverts would also be installed on these roads and would reduce sediment delivery to Rock Creek over the long term by reducing road surface erosion. No long-term adverse effects of the culvert replacements and installations on aquatic species or habitat are expected.

Sediment transport and turbidity would increase short term during the culvert replacement and for one to two days following the first substantial fall rains. The increased turbidity is unlikely to be visible or measurable beyond 0.5 miles downstream (*Foltz and Yanosek 2005).* The culverts are located 0.1 to 0.45 miles upstream of trout habitat in Rock Creek. Rainbow trout may either be displaced for up to 1.4 miles of Rock Creek with elevated turbidity, or their feeding would be disrupted (unable to see prey items; *Bjornn and Reiser 1991*) by short term increases in turbidity associated with culvert replacements.

Several cross-drain culverts would be installed on roads accessing Fawn Two and Outer Limits units. The cross-drains are not connected to streams and therefore would not contribute to aquatic habitats.

Peak Flows

Fish habitat downstream of proposed harvest units would not be impacted by the regeneration harvest alternative. The 6th field watersheds in both Outer Limits and Fawn Two areas are currently at low risk for potential increases in peak flows resulting from forest openings (*see EA Section 3.3.2.2).*

In the Fawn Two area

Threatened and Endangered Species

Regeneration harvest units are greater than 0.7 miles from listed fish habitat (LFH) in the Little North Santiam River (*see Table 18*). The proposed harvest would not impact LFH due to the minimum no-disturbance buffers of 240 feet on tributary streams without fish and 480 feet on streams supporting fish populations. These buffer widths are adequate to intercept and infiltrate water carrying sediment preventing its delivery to streams and aquatic habitats (*Olson and Rugger 2007, Rashin et al. 2006, CH2MHILL et al. 1999*).

Roads

The 0.25 miles of new road construction would not increase the size of the stream network (*Wemple et al. 1996*). All new roads are greater than 200 feet from stream channels, and constructed road surfaces would be designed to drain surface water to adjacent gentle slopes where it would infiltrated into the soil and ground water. No stream culverts are proposed for replacement.

Hauling

Steelhead and salmon habitat would not be impacted by log hauling. The haul route is gravel surfaced, with one stream crossing 0.8 miles upstream of salmon and steel head habitat in the Little North Santiam River. Other stream crossings are over a mile upstream of LFH. The maximum distance sediment and turbidity is likely to move from road crossings is 0.5 miles downstream (*Foltz and Yansek 2005*). The Fawn Creek road is well maintained with short ditchlines, and ditches are vegetated (thus limiting the capacity of the ditches to transport sediment; *Luce and Black 1999*), with no evidence of sediment moving to channels at the stream crossings.

In the Outer Limits area

Threatened and Endangered Species

Regeneration harvest units are greater than 2.7 miles from LFH in Rock and Madd creeks (*see Table 18).* Proposed harvest would not impact listed fish due to minimum-no disturbance buffers of 160 feet on streams adjacent to the regeneration harvest unit in section 17. In the thinning units, there is a minimum 70 to 85 foot no disturbance buffers on perennial tributaries and 30 feet on intermittent 1st and 2nd order tributary streams. These buffer widths are adequate to intercept and infiltrate water carrying sediment preventing its delivery to streams and aquatic habitats (*Olson and Rugger 2007, Rashin et al. 2006, CH2MHILL et al. 1999*).

In the thinning units, no disturbance to primary shade zones (within a minimum of 70 to 85 feet of the channel) and retaining a minimum 50 percent canopy closure in the secondary shade zone, would result in no change in stream temperatures of perennial streams located upstream of LFH (*BLM TMDL Implementation Strategy; Groom et al. 2011*). Thinning within 30 feet of headwater streams with intermittent flows would not alter summer stream temperatures because these streams do not have surface flow during the summer.

Roads

Little sediment would be produced by any new roads and would not reach LFH over 2.7 miles downstream. Approximately 0.37 miles of road construction would not increase the size of the stream network (*Wemple et al. 1996*). New roads are over 200 feet from stream channels and constructed road surfaces would be designed to drain surface water to adjacent gentle slopes where it would infiltrate into the soil and groundwater. No culverts would be replaced within 2 miles of LFH. Culvert replacements would have no effect on LFH because increased turbidity is unlikely to be visible or measurable beyond 0.5 miles downstream (*Foltz and Yanosek 2005*).

Hauling

Two potential haul routes may be used for the Outer Limits area: Monument Peak road and North Rock Creek road (*see EA Section 1.2, Maps*). The Monument Peak road crosses the middle portion of the Little Rock Creek watershed, and is paved once it connects to Gates School Road. The North Rock Creek road crosses the lower portion of the Rock Creek watershed before connecting to the paved portion of Rock Creek road.

The North Rock Creek road crosses several 1st and 2nd order tributaries to Rock Creek at 0.6 to 0.7 mile upstream of LFH. The road is well graveled (ca. 12 inch deep gravel bed) with short ditchlines, and ditch run outs are well vegetated (thus limiting the capacity of the ditches to transport sediment; *Luce and Black 1999*), with no evidence of sediment moving to channels at the crossings. Use of North Rock Creek Road for winter season log haul will have no effect on LHF (no sediment will move to LHF) both because of distance of crossings to LFH and condition of road surface, ditchlines, and ditch turnouts.

Most stream crossings on the Monument Peak haul route are 0.7 mile or greater from steelhead habitat in lower Little Rock Creek, with short ditch lines and no evidence of sediment moving to streams. However, three stream crossings are located on 1st order tributaries to Little Rock Creek in the SE ¼ of Section 2 (T.10S, R.3E) within 0.5 mile of listed fish habitat. Two of the three crossings have evidence of small amounts of sediment reaching the tributary stream, either from a ditch relief cut at the crossing, or water ponding on the inside curve of the crossing. A

third crossing has a long ditch line (450 feet long) connected to the stream crossing, but no evidence of sediment delivery from the road surface to the stream.

Log haul during the winter would have no effect on steelhead habitat, if ditch and road surface drainage is disconnected from the streams at the three crossings in the SE ¼ of Section 2 (T.10S, R.3E) using the following mitigation actions (*see EA Table 7, PDF #38):*

- Install straw bales or wattles in a short (81 ft. long) ditch line on the west side of the road at the downstream-most crossing.
- Install a line of straw bales or erosion fencing on the inside curve at the middle crossing to carry runoff and sediment past a ditch relief cut at the stream crossing and turn it out into a vegetated area downslope of the stream crossing; and install a series of straw bale sediment traps in the west ditch at the middle crossing to prevent sediment delivery from the ditch (450 ft. long) to the stream crossing
- Install a continuous line of straw bales or erosion fencing on the inside curve (east side) of the upstream-most crossing to carry runoff and sediment past the stream and turn it out into a vegetated area downslope of the crossing.

If logs are hauled during winter on Monument Peak road with the existing road and ditch conditions at these two stream crossings, insignificant amounts of sediment may potentially move 0.5 mile downstream to steelhead habitat in Little Rock Creek. BLM would then need to consult with the National Marine Fisheries Service (NMFS) on the impacts to winter steelhead.

Cumulative Effects for both areas

The Proposed Action (thinning and regeneration harvest) would have no direct impacts to channel morphology (channel shape and form) of streams in the project areas and hence to cumulative effects to channel morphology. With no direct or cumulative impacts to channel morphology, in stream fish habitat would not be affected.

No direct or cumulative impacts to peak flows are expected (*see EA Section 3.3.2.1*)

Alternative Action

Resident Fish and Aquatic Habitats

Widths of SPZs would be similar to that of the Proposed Action of regeneration harvest. Thus, impacts from tree thinning to fish and aquatic habitats would be similar to that of the Proposed Action.

Sediment and Roads

Similar to the Proposed Action, new and reconstructed roads would be located greater than 200 feet from stream channels and would be designed as to not increase the size of the stream network (*Wemple et al. 1996*). Road work would be designed as described in the Proposed Action to drain surface water to adjacent gentle slopes where it will infiltrate into the soil and groundwater. Effects associated with culvert replacement would be identical to the Proposed Action. Hauling routes would remain the same as with the Proposed Action, thus actions required to mitigate effects to listed fish in the area would still need to be implemented (*see EA Section 3.3.3.1 Hauling, and Table 7 PDF #38).*

Threatened and Endangered Species

Similar to the Proposed Action, thinning all the proposed harvest units and associated activities would have no effect on listed fish and their habitat. No-disturbance buffers would be the same as under the Proposed Action, and would be adequate to prevent impacts to LFH.

No Action Alternative

Populations of aquatic species would undergo natural increases and declines related to changes in aquatic habitat condition (i.e. changes in stream temperature, sediment delivery events, and peak winter flows). Stream temperatures increase when shade from riparian canopy is lost (*Johnson 2004*). Substantial increases in stream temperatures can increase the metabolic costs of trout (*Li et al. 2004*), resulting in lower survival and recruitment, and consequently reduced population abundance (*Hicks et al. 1991*). During periods of accelerated sediment delivery (flooding), recruitment success would be lower because of fine sediment reducing intragravel oxygen levels resulting in higher embryo mortality, and reduced population abundance (*Bjornn and Reiser 1991).* High winter flows likely reduces overwinter survival of cutthroat trout in western Oregon streams (*House 1995*).

Under the No Action Alternative, canopy closure in primary and secondary shade zones along stream channels would remain similar to current levels, except for changes to tree canopy and consequently stream shade levels resulting from snow or ice break, wind storms, and wildfire. Stream temperatures would follow changes in stream shading (*Johnson 2004*). LW availability would increase over the long term as tree stands mature. Dense stands of riparian trees would self-thin over time, contributing small wood (trees <24 DBH) to stream channels. Windthrow from storms would contribute LW to streams over the long term. Natural sediment inputs to streams would vary as sediment contributing events (flooding) occur within Riparian Reserve.

Threatened and Endangered Species

The No Action Alternative would have "no effect" on UWR steelhead trout and UWR spring Chinook salmon because no actions would be taken that would affect salmon and steelhead habitat.

3.3.4 Soils

Sources: *Soils: Specialist Reports for the Outer Limits and Fawn Two Areas (Soils Report) Hawe, 2015; Hydrology/Channels/Water Quality: Specialist Report s for the Outer Limits and Fawn Two areas (Hydrology Report) Hawe, 2015; Outer Limits/Fawn Two Logging Systems Report, Bernards, 2015*

Methodology:

- Soil maps and descriptions of the project soil characteristics are available at the Natural Resource Conservation Service (NRCS) web site: http://www.or.nrcs.usda.gov/pnw_soil/or_data.html
- Site specific conditions on BLM lands in the project area were mapped and field-verified in the Timber Production Capability Classification (TPCC) database (*Power and Tausch 1987*).
- BLM Cascades RA Resource Specialists for soil and hydrology visited the project area multiple times, performing both formal surveys and informal reconnaissance, including digging small pits, to evaluate site specific conditions.

3.3.4.1 Affected Environment

Soil Series and Characteristics

Typical soils in these project areas formed in colluvium (i.e., material rolling downhill) from basalt, andesite rock and volcanic ash. Soil series mapped in the Fawn Two area are primarily Henline very stony sandy loam on slopes 30-50 percent, Kinney cobbly loam on slopes 20-50 percent and Horeb loam on slopes 2-20 percent.

Soils on the north facing slopes of Monument Peak in the Outer Limits area formed in volcanic ash and andesite at higher elevations. These soils tend toward shallower, stony loams such as Henline very stony sandy loam 6-80 percent, Henline-Yellowstone rock outcrop complex on 50-90 percent slopes, Bensley-Valsetz stony-loams 30-75 percent, Hummington very gravelly loam, 25-50 percent slopes and Rock outcrop-Orthents complex, very steep (*see Table 19 for a list of soil series and selected properties in the proposed treatment units*).

Project area soils are suited for growing Douglas-fir and western hemlock. Soil maps and descriptions of project soil characteristics are available at the NRCS web site: http://websoilsurvey.nrcs.usda.gov/app/.

Table 19. **Primary Soils Series in Treatment Units**

Soil Series[1]	Limitations/Hazard	Percent Slope[2]	Percent Clay	Erosion Factor (Kw)[3]	Percent Coarse Fragments[4]
Kinney cobbly loam	compaction	20-50	18-30	0.10	15-30
Horeb loam	compaction	2-20	20-30	0.28	<10
Rock outcrop-Orthents complex	Not suitable for forest production	80 +	N/A	N/A	N/A
Hummington vry gravelly loam	shallow depth windfall	25-50	7-18	0.10	15-30
Henline very stony loam	shallow depth windfall	30-75	7-15	0.10	15-50
Cruiser gravelly loam	shallow depth windfall	30-75	0	0.17	0-5
Bensley-Valsetz stony loams	shallow depth windfall	30-50	15-25	0.15	15-45

[1] Principal soil series in Soil Data Mart data for Linn County Area, Oregon (USDA Natural Resources Conservation Service, 2005)
[2] Slope values estimated.
[3] Soil erodibility factor, Revised Universal Soil Loss Equation (RUSLE); 0.0-0.2 = readily infiltrated, 0.2-0.3 = intermediate infiltration and moderate structural stability, >0.3 = more easily eroded with low infiltration capacity (Brady 1996, Wischmeier and Smith 1978).
[4] Rock fragments > 3" diameter in A and B horizons.

Timber Production Capability Classification (TPCC)

In addition to the large scale County soil mapping, BLM lands in the project area are mapped and field-verified in the TPCC database (*BLM 1987*) which is more precise and accurate than county soil maps and is focused on forest productivity. "The purpose of the TPCC is to interpret soil and land characteristics to assist in timber management planning and in the application of

practices which will maintain or enhance production over a long period of time" (*Preface to the TPCC Manual*).

All lands on BLM are classified as either s*uitable* for timber production, *suitable but fragile* for a variety of reasons (e.g., nutrient status, compacted surfaces, slope gradient, etc.) or *non-suitable*. All of the proposed harvest units are within areas classified as *suitable* or *suitable but fragile* and PDFs (*EA Table 7*) incorporate recommendations to reduce potential effects to soils.

Non-suitable lands in the project area are wet areas, rock outcrops and areas with slopes >80 percent, areas with low nutrient status, and areas prone to mass movement. Proposed unit boundaries were developed to appropriately avoid areas that are currently mapped as non-suitable. Most of the wet areas are adjacent to streams and wetlands, all of which are within SPZ and would not be treated. Fragile withdrawn areas due to high slope gradient are concentrated along escarpments and ridges scattered throughout the project areas but concentrated in the units near Monument Peak; these areas are also excluded from treatment.

Among the suitable but fragile areas proposed for treatment are most of the Outer Limits units around Monument Peak on south and south west facing slopes and ridgelines classified as FSR1 and FSNR1. These sites are fragile due to low soil moisture and nutrients. A second "fragile" TPCC classification in the project area is FSR2. This indicates that much of the area was previously harvested by ground based equipment, typically crawler tractors, and that skid roads and disturbed surface soils comprise more than 10 percent of the unit.

Based on field review by BLM specialists, outside of the previous skid road network, soil surfaces generally appear to be in a non-compacted state and are covered with a moderately deep layer of surface "duff" (i.e., partially decomposed organic material, mostly needles, bark and wood, that protects the mineral soil surface). Some slight compaction (increase in bulk density of less than 10 percent relative to un-compacted soils) may persist in the area outside of the visible skid trails and roads as a result of previous logging that was accomplished with heavy ground based equipment. However, it is difficult to assess how much if any of this disturbance remains because it is obscured by tree growth and the surface duff layer. Random small pits dug by BLM specialists did not reveal any compacted soil surfaces beneath the duff and thus it is reasonable to conclude that compaction outside of road and skid trail surfaces, if it remains at all, is discontinuous and of no consequence to soil properties or fertility.

Existing Compaction

Road Surfaces and compaction in the Fawn Two area

There are approximately 87 miles of roads in the Elkhorn 6th field watershed. Assuming an average 25 foot wide "footprint" on the soil surface (covering 264 acres) or 1.5 percent of the surface area in this watershed is road surface. However, based on field observation by BLM specialists, the condition of these road surfaces varies widely from paved highways (e.g., North Santiam county road) to barely discernible natural surface "roads" that were utilized at one point in time to haul cut trees to market.

A few moderately compacted soil surfaces (i.e., bulk density of the soil has been increased by over 10-20 percent relative to un-compacted soils) have visibly persisted in some of the skid trails. Moderately compacted soils are primarily located along skid trails (i.e., sites where trees were dragged along the ground) and are generally less than 10 feet in width and discontinuous since large portions of former skid trails have been obscured by the growth of trees and

development of the duff layer. Based on the proceeding observations, a conservative estimate is that approximately 2 percent of the soils in the project area are slightly to moderately compacted (bulk density increase of 10-20 percent). Therefore, with the addition of road density estimates from above, a rough estimate of total compacted surfaces is approximately 4 percent of the 6th field watershed as a whole.

Road Surfaces and Compaction in the Outer Limits area

For the two 6th field watersheds (Rock Creek and Madd Creek): there are approximately 92 miles of road in the Rock Creek 6th field watershed (19.1 square miles). Similarly, the Madd Creek 6th field watershed (21.1 square miles) has 115 miles of road. Assuming an average 25 foot wide "footprint" on the soil surface (covering 264 acres) or 1.5 percent of the surface area in this watershed is road surface. Based on field observation by area specialists, the condition of these road surfaces varies widely from paved highways (e.g., the paved county access road) to barely discernible natural surface "roads" that were utilized at one point in time to haul cut trees to market.

Moderately compacted soil surfaces has visibly persisted in the skid trails viewed by the BLM hydrologist during field visits, but there are very few visible skid trails. The majority of BLM lands in this area are on moderate to steep slopes that were not logged with ground based equipment. Assuming that the 10 percent of compacted surfaces due to previous entry ground based logging is representative of all the lower slope class lands in the project area (<35 percent gradient), approximately 30 percent of the surface has been affected (estimated from Lidar), leaving 3 percent of the watershed with "moderately compacted soil surfaces".

A conservative estimate is that approximately 3 percent of the soils in the project area are moderately compacted (bulk density increase of 10-20 percent). Therefore, with the addition of road surfaces estimates from above, a rough estimate of soil surfaces with discernible compaction is between 5-6 percent of the project watersheds. This assumes, since logging methods were similarly applied, that conditions viewed on public lands are similar to those on adjacent private and State of Oregon holdings.

3.3.4.2 Environmental Effects

BLM has observed the effects of logging operations in thousands of acres of commercial thinning for several decades under a variety of conditions. The following descriptions of direct effects are drawn primarily from those observations which include formal monitoring, stand measurements and observations during the course of other duties. The following descriptions of indirect effects are based on analysis in the RMP/FEIS as reflected in the RMP BMP, on published research and on BLM field observations.

Proposed Action

Direct Effects on Soil Compaction/Disturbance/Displacement

Ground Based Logging

Following completion of the harvest, the majority of understory vegetation and root systems would remain, along with surface soil litter and slash from harvested trees. The expected extent of skid trails ("[Pathways] created by dragging logs to a landing (gathering point)." *FEIS 6-14*) combined with the portion of landings which are outside of road prisms and subject to equipment operation would be limited to less than 10 percent of the surface in each project area unit (*RMP*

C-2). The standard Salem District BLM timber sale contract provision requires that skid trails be no more than 12 feet wide and spaced an average of 150 feet apart, resulting eight percent of the surface area included in skid trails and leaving two percent for landing areas outside of rights-of-way and skid trail junctions.

Compaction in skid trails would be concentrated under the tracks or wheels of skidders and would be confined to within the 12 feet wide skid trails. In a study of logging traffic on fine textured soils in northern Idaho, the area between wheel tracks was much less pronounced and in many of the moisture/slash/depth combinations tested there was little or no statistically significant difference between the center line and the undisturbed reference soil (*Han et al. 2006, pp. 16, 17).* This is consistent with the observations by IDT members of logging personally observed over the last three decades and of examining numerous existing skid trails from the past century of logging in the Cascades RA.

Han-Sup Han et al. also found that: 1/ dry soils were most resistant to compaction; 2/ moderately moist soils (21-30 percent) were near to an optimum moisture content for compaction for this fine textured soil and were most easily compacted; and 3/ soils with excessive moisture (though the surface drained to approximately 30 percent, field capacity for this soil) "did not provide support against the equipment's ground pressure and allowed the tires to penetrate into the deeper soil levels" regardless of slash mat (*p. 18*). The degree of compaction, indicated by penetration resistance, increased from pre-harvest reference levels up to the fourth pass of equipment (1 – harvester, 2 – empty forwarder, 3 and 4 – loaded forwarder), then generally did not consistently increase with eight additional passes with the loaded forwarder. This pattern is also consistent with multiple references cited in the RMP/FEIS, RMP and Soils Report and with field observations of IDT members as described above.

A single pass with a harvester (or by extension, other equipment with a similar tracked carriage) operating on a heavy slash mat does not compact soil to an extent which is likely to inhibit root penetration. Han et al. also noted that "a single pass of the harvester on the slash mat did not increase penetration resistance…at the 10 cm [4 inches] depth" even at the most compactable soil moisture level, but that it did increase resistance at the 20 and 30 cm depths (8 and 12 inches) (*pp. 18-20*). They noted (*p. 17*) that past studies (citation made in the original) suggest that compaction exceeding 2500 kPa of resistance would prevent root penetration. The compaction levels on the most compactable moisture level in the study show that compaction from a harvester working on a slash mat does not approach the 2500 kPa level. Sang-Kuyn Han, a co-author, notes in his Master's Thesis (*2006, p. 6, citing Han et al. 2006*) that "…one pass of a tracked machine does not significantly impact this [fine textured] soil type." This is also consistent with other studies such as those referenced in RMP/FEIS Appendix S-1, and with BLM IDT member's observations in more recent thinning operations.

Moderate-to-heavy soil compaction (>20 percent increase in bulk density) in the first 12 inches of topsoil would be indicated by ruts up to approximately 6 inches deep. The soils specialist estimates that the area impacted by surface disturbance and soil compaction from skid trails would be 9 percent of the ground based yarding area (144 acres, not including road rights-of-way; *EA Section 2.3.1*), or approximately 13 acres of disturbed and/or compacted soil in skid trails.

Additional soil surface area would be disturbed to some degree as logs are cut, moved and stacked. Mechanized harvest systems using a tracked carriage moving between skid trails may be employed (purchaser choice), resulting in some disturbance on approximately 50 percent of the surface area as it cuts, limbs, bucks and stacks logs. With careful operation using an appropriate combination of low soil moisture, operating on a slash mat (usually created by limbing trees immediately in front of the harvester and/or placing additional slash in front of the harvester), single pass operations, and operating only on low (<45 percent) slope gradients, soil compaction would be discountable since it is not likely to measurably affect bulk density of the soil (*Allen et al. 1999*). Han, Sup-Han et al. (*2006*) noted that "A single pass of the harvester on the slash mat did not increase penetration resistance [compaction]". Wronski and Humphreys (*1994*) found that the type of harvesters used on recent BLM timber sales and working on a slash mat "…can work with minimal impact on all soils in the region irrespective of weather conditions" and that feller-bunchers were not capable of creating slash mats for the machine to work on. These two findings are consistent with recent BLM experience.

In areas where trees are felled and bucked using chainsaws, soil surface disturbance would occur as logs are winched to skid trails because little or no suspension of the leading end of the logs is feasible. The author is not aware of any studies quantifying the areal extent of this disturbance. No compaction would be expected between skid trails from these operations since no heavy equipment would be used between skid trails.

Skyline Yarding

In skyline yarding areas the trailing end of the trees being yarded would usually drag on the surface in the skyline yarding corridor. Impacts usually consist of light, discontinuous compaction and surface soil and duff displacement in a strip approximately four feet wide within a 12 feet wide skyline corridor. The BLM soils specialist estimates that a maximum of 5 percent of the 118 acres estimated for skyline yarding in the project area would be disturbed and/or compacted in this way, which equates to a total of 6 acres.

Aerial Yarding (helicopter)

In aerial yarding, impacts are limited to light, discontinuous areas of soil duff disturbance (less than 1 meter^2 dispersed randomly throughout the unit). There is no discernible soil compaction from aerial yarding. The soils specialist estimates that a maximum of 1 percent (1.1 acres) of the 109 acres estimated for aerial yarding in the project area would be disturbed and/or compacted in this way.

Landings

Heavy compaction at landings would be primarily within the road prism (included in this analysis as part of roads rather than logging systems) and skid trail drop-zone (included in this analysis as part of skid trails) where equipment operates. If additional excavation were to be required for setting up a skyline tower serving multiple skyline corridors, that area would also be compacted. Additional soil and duff layer would be disturbed and potentially lightly compacted where logs are sorted and stacked prior to loading and where landing slash is stacked during operations. The soils specialist estimates that landing compaction would be expected on approximately 1 percent of the project area, or 37 acres. Approximately 10 additional acres of landings could be constructed in the Rock Creek drainage to accommodate helicopter logging for a total of 13.7 acres.

Road construction and maintenance

Total construction of new roads would displace topsoil and compact subsoil on 0.50 miles or 2-3 acres (2,640 feet, average 30 feet wide "footprint"). The intensity of this disturbance would be severe with the topsoil and duff removed and/or displaced and the subsoil compacted to a bulk density where it would no longer allow for water infiltration. The roads to be constructed would be predominately on low to moderate topography (grades <35 percent), so the total width of the clearing would be expected to be a maximum of 30 feet.

Drainage structure improvements and/or replacement at several locations would improve drainage and reduce road surface erosion into the surrounding area and streams. Minor short-term roadside erosion would be expected when established vegetation in the ditch and culvert catchment areas is removed, which would be expected to return to very low levels within one or two seasons as litter-fall accumulates and vegetation regrows.

All new roads are essentially permanent features for soil processes because they will not recover to pre-disturbance conditions within a human lifetime without treatment. Closing and stabilizing new road surfaces would initiate the process of restoration of natural soil physical and biological conditions. On natural surfaced, newly constructed roads, tilling of the soil surface would reduce bulk density and improve water infiltration rates allowing for plants and trees to establish and grow. Over a period of several decades to a century, these surfaces, if not re-disturbed, would gradually return to a pre-treatment condition undiscernible from adjacent soils. Newly constructed roads that are rocked or roads that are not tilled would not recover to a pre-treatment condition for more than a century and are thus essentially permanent features.

Machine Piling and Pile Burning

Machine piling of slash to reduce fire risk along property boundaries and roads would be expected to disturb and compact approximately 2 percent of the treated surface in ground based units or 6 acres. Limbs and other logging slash <6 inches diameter would be piled and burned to provide a fire break. Intensity of this disturbance would depend on soil conditions, operator and equipment. Typically, light to moderate soil displacement and compaction of the top 6 inches and duff layer would be dispersed across these surfaces. Where piles are burned, surface organic material (O-horizon) would be removed, however sediment delivery to streams is highly unlikely since burn-pile areas are outside Riparian Reserves, widely dispersed, and typically smaller than 20 feet in diameter. Displaced soil would be filtered and retained by the intact vegetation immediately surrounding the burn pile spot. Since burning would occur during wet soil conditions, heat damage to the upper soil layer (A-horizon) would be moderated and only occur in scattered localized sites (*see Fuels Report and EA Section 3.9*.)

Broadcast Burning

Broadcast burning is unlikely to result in increases surface water run-off or surface erosion. Broadcast burning would occur across regeneration treatment units of varying gradients and is not expected to produce sufficient heat energy to cause changes in soil surface properties such as water infiltration rates.

Other

The Proposed Action would maintain sufficient mycorrhizae populations because the root systems of most vegetation would remain undisturbed on at least 90 percent of the unit area, and there is no evidence that past disturbance of the area has affected mycorrhizae populations.

The narrow openings created by skid trails (12 feet wide), skyline corridors (14 feet wide) and natural surface road construction (approximately 25-37 feet wide) would not noticeably affect average tree spacing of 18 to 27 feet average after treatment. The listed widths of these openings are between tree trunks, tree crowns extend into the "open" area.

Many limbs and other logging slash and debris would be expected to remain scattered over the unit areas, except for the fuel reduction described above, because there is no economic or management reason to remove the slash. If an operator yards trees with tops intact and processes them at the landing, fewer limbs would remain scattered over the unit area, but there would be at least as much organic material on the ground as there was prior to logging. This organic material would decay over the next 1-2 decades, becoming part of the O-horizon and returning nutrients to the soil.

Stabilizing skid trails and natural surface roads by shaping (such as water bars), seeding with native species, and/or covering them with slash and debris would promote drainage and prevent water from accumulating in large quantities that could cause erosion. Accumulated litter-fall on the road surfaces would further reduce any potential for surface erosion over the next several years. Blocking skid trails with barriers and logging slash would prevent vehicle use which could cause erosion.

Removal of rock for use on roads would not affect soil productivity because all potential rock sources are already developed rock pits.

Summary of Direct Effects

There is an overall maximum increase of 40 acres (11 percent of the treatment area) in moderate to heavy compaction/disturbance of soils under the Proposed Action from all sources, including the full 12 feet width of skid trails spaced 150 feet apart (average) under standard Salem District timber sale contract provisions and machine piling. The BLM soils specialist on the IDT estimates, based on past observations, that approximately 31 percent of this disturbance (12 acres) would be of low intensity, meaning soil physical properties would likely recover to pre-disturbance conditions, without active restoration, within several years. Approximately 31 percent of this disturbance (12 acres) would be severe, meaning soil physical properties are unlikely to recover to pre-disturbance conditions without active restoration. The remaining 38 percent of the disturbed soils (16 acres) would be moderately disturbed, meaning soil physical properties would eventually recover to pre-disturbance conditions, without active restoration, following several decades without further disturbance.

The Proposed Action would not lead to any measurable increase in surface erosion, and soil erosion would remain within the range of background rates. BLM field reviews (*Hawe 2012*) of skyline and ground-based logging units on BLM land during intense rainstorm events from 2007-2012 found no evidence of surface erosion or overland flow on units where erosion models had predicted surface erosion and sediment transport after logging under similar conditions. The project would have no effect on mass wasting processes, as described under Hydrology, EA Section 3.3.2

Indirect Effects on Site Productivity due to Soil Disturbance – Displacement and Compaction

Soil productivity is the "capacity or suitability of a soil for establishment and growth of a specified crop or plant species, primarily through nutrient availability." (*RMP/FEIS Ch. 6, p. 4*)

For this project, productivity of these forest stands is indicated by the growth and yield at the stand level as indicated by changes in radial growth (measure of growth) and the corresponding rate of increase in timber volume (the crop). The BLM accepts that differences in mean diameter growth and total stand volume and value over the rotation are the net indirect effects on site productivity due to soil disturbance from commercial thinning. General plant species richness and growth may also be a visual indicator, though not measured.

Site Productivity for Regeneration Harvest

The BLM does not expect a measurable loss in timber stand productivity over the next century due to soil compaction and disturbance from logging operations in the regeneration harvest units. The BLM is aware that published research, including studies relied on for the 1994 RMP/FEIS (Appendix S), showed wide differences in apparent Douglas-fir growth response to soil disturbance in regeneration harvests. Heninger et al. (*2002, p. 244*) found that Douglas-fir trees planted in the most compacted parts of skid trails initially showed decreased growth compared to trees planted in the rest of the unit but that after seven years the growth was similar. After ten years, trees planted in compacted ruts were about one growth-year shorter and 29 percent less bole volume than the other trees. Since both absolute and percentage differences in total height decreased with time and the trend is expected to continue, the BLM concludes that the overall stand productivity loss would be too small to measure at rotation age.

Heninger et al. (*2002 pp. 234, 242, 243*) found that "most" of the skid trails on silty clay loam soils in the western Cascades which were skidded in wet, winter conditions with tracked and rubber-tired skidders "…did not approach root-limiting [bulk densities] for Douglas-fir as reported in the literature" (Literature cited in the article). Since ground based skidding under this proposal would be limited to "dry soil conditions", this proposal has even less chance of compacting surfaces enough to limit tree growth in the newly planted stand.

The Heninger study also noted that "tilling skid trails fully ameliorated growth losses [but also that] planting tree seedlings beside skid trails (in soil berms) instead of in ruts proved to be a practical means to avoid growth losses" (*p. 244*). This study on eight sites was done in the western Oregon Cascades near Springfield, within approximately 50 miles south of the current project.

Site Productivity for Thinning

Similarly, the effect of the Proposed Action on overall (stand level) site productivity caused by soil compaction and displacement is expected to be too low to measure at the stand level. Thinning results in increased rates of radial growth and understory vegetation (*see Vegetation, EA Section 3.4*), and any potential reductions in growth from soil compaction and displacement would not be discernable. The BLM has observed this effect on thousands of acres of similar thinning for several decades. Thinning is a widely accepted silvicultural practice used to accelerate tree growth and is supported by decades of research, observation and practice on public and private lands.

Specifically:

- Light compaction caused by skyline yarding is expected to be too low to cause a measurable reduction in overall yield for the stands.
- Light compaction caused by mechanized harvesters operating on slash mats between yarding corridors and skid trails is expected to be too low to cause a measurable reduction in overall yield for the stands.
- Heavy compaction and displacement in heavily used skid trails and light to moderate compaction and displacement in skid trails with less use is expected to be too low to cause a measurable reduction in overall yield for the stands.

Miller et al. (*2007*) found that previously reported research showed wide differences in apparent Douglas-fir growth response to soil disturbance in thinning operations while their research found increased growth in individual trees adjacent to skid trails. Compacted skid trails affect no more than 40 percent of the rooting area of trees adjacent to a skid trail and the trees appear to positively respond to reduced competition to a higher degree than they negatively respond to skid trail compaction in the rooting zone, resulting in higher overall growth. Any potential individual tree growth rate reduction caused by compaction on no more than 10-12 percent of the forest stand is undetectable within the overall increased growth and production at the stand level.

Pile Burning and Broadcast Burning

The BLM does not expect any discernable loss in site productivity because discontinuous soil disturbance from machine operations as described would not be intense enough to reduce tree growth at a stand level and the burned areas would be scattered and small, potentially impacting only a small portion (<25 percent) of the rooting area of any tree.

Broadcast burning would occur under moist soil conditions which would maintain heat energy below levels likely to affect site productivity. In the short term, research suggests that light burning increases availability of some nutrients by providing a nutrient rich ash layer.

Cumulative Effects

Soil Disturbance – Displacement and Compaction

The BLM soils specialist estimated the extent of existing compacted/disturbed soil surfaces in the project watersheds as a whole, including road surfaces, at 11 percent (approximately 40 acres). Increasing compacted surfaces by 40 acres in this proposal would result in a 0.01percent cumulative increase in the percentage of compacted surfaces. This magnitude of compaction on a watershed scale is unlikely to result in any discernible cumulative effect since the compaction is dispersed across the landscape.

At the conclusion of the project the quantity of compacted/disturbed soils (other than road surfaces) would begin to decrease over time and would approach current levels within a decade as soil surfaces recover through natural processes (e.g., freeze-thaw, animal and insect burrowing, tree fall, root growth, etc.).

Soil Erosion

The Proposed Action would not lead to any measurable increase in surface erosion, and soil erosion would remain within the range of background rates. Estimated background surface erosion rates in the project areas are in the range of the assumed rate of soil formation (0.12-0.8 tons/acre/year, *Pimentel 1987*) otherwise there would be no surface soil. Mass wasting is the

primary cause of soil erosion in forested regions of the Pacific Northwest and this proposal would have no effect on mass wasting processes (*see EA Section 3.4, Hydrology; Hydrology Report*).

Alternative Action

Soil Disturbance – Displacement and Compaction

The intensity of compaction and surface disturbance on treatment units and at landings may be lower than described for logging the same area with the same logging methods for regeneration harvest, (i.e., Proposed Action) because the number of trees removed and logs yarded would be reduced. However, research indicates that disturbance levels to soils are maximized after only 3-4 passes, which would occur under both the Proposed Action and the Alternative Action. The patterns of compaction and disturbance from logging would be similar for that described above under the Proposed Action because the same logging methods would be utilized. Similarly, the Alternative Action would disturb the same number of acres as the Proposed Action. All other effects to the soil resource, as described under the Proposed Action, would be similar to this proposal which would retain more trees per acre.

No Action Alternative

Under the No Action Alternative, there would be no changes to natural processes affecting soil conditions and characteristics.

3.3.5 Wildlife

Sources: *Cascades Resource Area EA Wildlife Report for Outer Limits, Cascades Resource Area EA Wildlife Report for Fawn Two, Murphy 2015(Wildlife Report); Outer Limits/Fawn Two Silvicultural Prescription, Bonney et. al 2015; Outer Limits/Fawn Two Fuels Specialist Report, Mortensen et. al 2015; Outer Limits/Fawn Two Logging Systems Report, Bernards, 2015; Little North Santiam Watershed Analysis (1997) and the North Santiam River Watershed Assessment (2002).*

BLM Cascades RA Wildlife Biologists assessed potential effects to terrestrial species by using the following methodologies:

- BLM Wildlife Biologists compiled a list of Wildlife Special Status/species of concern in the Cascades RA using BLM wildlife databases, BLM Special Status Species lists (BLM IM OR-2012-018), Oregon Biodiversity Information Center lists (*ORBIC 2013*), various wildlife field guides, literature, and texts.
- The BLM Wildlife Biologists determined the presence of special habitats, and the amount of snags and down logs present from stand exam data, aerial photos, and field review.
- BLM Wildlife Biologists visited the project area during the 2013, 2014 and 2015 field seasons and examined habitats in and adjacent to proposed Outer Limits/Fawn Two project units.
- From the Cascades RA list, the BLM Wildlife Biologists compiled a list of Special Status/species of concern documented or suspected to occur in the Outer Limits/Fawn Two project area based the proposal's geographic location, elevation, and knowledge of habitats present gained through air photo interpretation, stand exam data, GIS information, and field reconnaissance. For each of those species they determined habitat associations and the presence or absence of suitable habitat. The resulting list of Special Status species which are known or suspected to occur in the Outer Limits/Fawn Two project area and their habitat preferences are included in Table 6 of the Wildlife Report incorporated by reference into this EA.
- For migratory and resident birds, BLM Wildlife Biologists developed a list of migratory bird species of conservation concern and/or focal species which may breed in the Outer Limits/Fawn

Two project area (*Altman and Hagar 2007; Altman 2012*). These species and anticipated short and mid-term responses are listed in Table 7 of the Wildlife Report.

- For northern spotted owl (spotted owl): The North Santiam 5th field watershed has a long history of spotted owl surveys that date back to the early 1980s. Additional surveys for spotted owls will be conducted to determine presence in the future.
- Surveys for red tree voles and Survey and Manage mollusks were conducted on project units which are over 80 years old. Two mollusk surveys were conducted – Fall 2014 and Spring 2015. Results are documented in section 3.3.5.1 (*Protocol from Duncan et al. 2003*). Red tree vole surveys were conducted in Spring and Summer of 2013 and 2014.
- For CWD information, Stand Exams were conducted in 2007 and 2014. Any additional stand information was gathered by BLM personnel.
- BLM Wildlife Biologists assessed the suitability for treatment of Riparian Reserve stands adjacent to proposed Matrix thinning units by:
    - Conducting field examinations of those Riparian Reserve stands to assess stand complexity and other habitat characteristics based on their training and professional experience.
    - Consulting with the BLM Silviculturist and examining stand exam data.
    - Consulting with the BLM Cascades RA Logging Systems Specialist to determine if treatment is feasible using existing roads or roads to be constructed for managing Matrix land when the BLM Wildlife Biologist determined that silvicultural treatment could benefit habitat conditions.

3.3.5.1 Affected Environment and Desired Conditions

Habitat Condition

The Outer Limits/Fawn Two area is located in the Little North Santiam 5th field watershed (Fawn Two area) and the Middle North Santiam 5th field watershed (Outer Limits area).

The BLM manages approximately 18 percent of 72,190 acres of the Little North Santiam 5th field watershed and approximately 11 percent of the 56, 591 acres of the Middle North Santiam 5th field watershed (*see EA Section 3.2, General Settings*)

Seral stages on BLM land of forest stands associated with these watersheds are depicted in EA Section 1.3.1.1 Table 1, and EA Section 3.3.1.1 Tables 11 – 13.

Early-Successional Stands and Early-Seral Habitat

Analysis shows that early successional habitat is lacking on BLM lands in these watersheds and the early successional habitat on private industrial timberlands in the watershed is generally lacking structural elements, plant species diversity and spatial diversity associated with fully functional early seral habitat (*see EA Section 1.3.1.1*).

The objectives of intensive forestry practices utilized on private industrial timber lands are for maximum economic return from conifer timber. Harvest is usually done on large tracts based on ownership, timber volume, road systems and logging feasibility. Typically, private lands are not broadcast burned after regeneration harvest. Broadcast burning as proposed under this project would provide a release of nutrients for post burn vegetation growth and diversity. Vegetation which provides forage species diversity and understory development are actively suppressed on

private industrial timber land with herbicides and/or cutting because they compete with conifer growth and establishment. Conifer density is managed to fully utilize growing space which restricts light reaching the understory as the canopy closes. Species composition of private plantations is typically monoculture, or at least limited to very few conifer species. The early and mid-seral habitat provided by these practices is generally is, lacking in the species diversity, structural elements and spatial diversity associated with high quality early and mid-seral habitat.

Snags, Down Logs (CWD), Remnants and Special Habitats

Snags, down logs, and special habitats provide important ecological functions for many wildlife species. Special habitats consist of wet and dry meadows, wetlands, talus, cliffs and rock outcrops. The presence of remnant trees and special habitats, and the amounts of snags and down longs present were based on stand exam data, aerial photos, and field review by specialists and are summarized in Table 20.

Table 20. **Summary of special habitats, remnant trees and down logs by project unit**

Units (Outer Limits)	**Location**	**Seral Stage***	**Remnant trees**	**Special Habitats****	**Down Logs*****
17A	10S-4E-17	Early Mature	No	No	0/353’
17A (Regeneration harvest unit)	10S-4E-17	Early Mature	No	No	0/353
17B	10S-4E-17	Early mature	No	No	0/347’
29A-F	10S -4E-29	Late Mid	No	No	0/260
Units (Fawn Two)	**Location**	**Seral Stage***	**Remnant trees**	**Special Habitats****	**Down Logs*****
25A, B	8S-3E-25	Mature	Yes[42]	No	0/246.9

**Seral Stage Age Classes (years) based on Stand Exam data: Early Seral = 0-30; Early Mid Seral = 30-40; Mid Seral = 40-60; Late Mid Seral = 60-80; Early Mature Seral = 80-120; Mature = 120-200; Old Growth =200+*
***Special habitats within the units include: wet and dry meadows, talus, cliffs and rock outcrops. Presence of adjacent special habitat, wetland, pond adequately protected with no treatment buffer.*
**** Linear ft./acre >19” diameter and>20’ long, hard (decay classes 1-2)/soft (decay classes 3-5) logs.*

Coarse Woody Debris

BLM’s management direction for down CWD in the Matrix is the leave a minimum of 240 linear feet of down logs per acre at the time of regeneration harvest. Logs should be at least 20 inches in diameter at the large end, 20 feet in length, and in hard decay classes 1 and 2 (*RMP pp 21,25,46*).

Existing hard down logs in the Outer Limits area are less than 20 inches in diameter. Units 17A, 17B and Section 29 have average diameters at 16.4, and 14.8 inches respectively (quadratic mean diameter (QMD)). Live trees are small in diameter and the Outer Limits area has limited recruitment of hard down logs over 20 inches in diameters. Numerous hard logs ins smaller size classes are the result of recent suppression mortality. These small logs are much less useful than larger logs for forest floor-associated wildlife species because they have less volume, persist for shorter periods of time (usually less than two decades) and are less thermally stable than larger material.

[42] There was one legacy Douglas-fir found in Unit 25A (*see EA 3.3.3.1*)

There is also a shortage of large hard down logs in the Fawn Two area. Most of the existing hard down logs in the Fawn Two area are less than 20 inches in diameter and are the result of recent blow down and suppression mortality. Existing soft down logs (decay classes 3-5) are usually remnants of defective trees that were not removed after harvest or large CWD from the previous stand. There is an abundance of this type of material in most of the proposed units and in adjacent stands. These logs provide valuable habitat for a whole host of down CWD associated wildlife species, including various rodents, amphibians and reptiles (*O'Niell et al. 2001*), and they persist for many decades before passing through advanced decay classes to become unrecognizable as down logs.

Snags

Table 21 summarizes the number of snags necessary for five cavity-excavating woodpecker species to maintain 40 percent of potential population levels (*Neitro et al. 1985*). These quantities are used as management direction for snag retention in the Matrix (*RMP p. 21*) at the time of regeneration harvest.

Table 22 summarizes the snags currently present in the project areas. A diameter of 15+ inches was used because most wildlife species that utilize snags are associated with snags greater than 14.2 inches (*Rose et al. 2001*). Smaller material has less volume, thus providing less habitat, and does not persist as long in the forested environment as larger material.

Table 21. **Minimum number of snags necessary to support species of cavity nesting birds at 40 percent of potential population levels (*RMP p. 21, as per Neitro et al, 1985*).**

Diameter class (inches DBH)	Snag Decay Stage		Total by diameter class (per 100 acres)
	Hard 2-3	Soft 4-5	
11+		Downy woodpecker (6)	6
15+	Red-breasted sapsucker (18)	Hairy woodpecker (77)	95
17+		Northern flicker (19)	19
25+	Pileated woodpecker (2)		2
Total – all diameter and decay classes			**122**

Table 22. **Summary of existing snags by project unit based on stand exam data and field review.**

Snags at least 15' tall/ 100 acres						
Unit #	Snags 15-25"		Snags greater than 25"		Total snags (15"+)	
	Hard	Soft	Hard	Soft	Hard	Soft
Outer Limits						
17A	210	430	0	260	210	630
17A Regen	0	0	0	0	0	0
17B	0	0	0+	1270	0+	1270
29A-F	0+	0	0	40	0+	40
Fawn Two						
25A, B	0+	1.9*	0	2.0*	0	3.9*

The use of 0+ in the table denotes trace numbers of snags present that did not appear in the stand exam.
*Most of the snags are soft according to stand exam data

In the Outer Lmits area the snag habitat within the proposed units consists mainly of small diameter hard snags and large diameter soft snags. Trees that could have developed into large snags and down logs were removed by past timber harvest and stand replacement fire. Most of the existing snags are small (less than 15" diameter) and the large logs that are present are in advanced decay classes.

There are rock outcroppings and rock gardens adjacent to units 17B. These features will be buffered and posted outside of the unit boundaries.

In the Fawn Two area the snag habitat within the proposed units consists mainly of decay class 3, 4 and 5 which are the soft snags. There are very few hard decay class snags, none appeared in the stand exam plots. There are a few large remnant trees in the stand and a component of large (greater than 35 inches DBH) second growth. Stand exams indicate that there are 4 to 5 large trees per acre.

Special Habitats

Special Status, Survey and Manage and Other Species of Management Concern

Vegetation surveys (stand exam data) indicate that most of the stands proposed for treatment are lacking in habitat elements that support diverse populations of wildlife species especially large, older trees (over 200 years), large snags, down logs, deciduous understory and ground cover vegetation.

Surveys for red tree voles and Survey and Manage mollusks were conducted on units over 80 years old (*Pechman exemption 2006*).

In the Outer Limits area

Surveys for red tree voles were conducted during spring 2013, and they were confirmed in units 21, 17A and 17B. Unit 21 has since been dropped from the project proposal. Three reserves totaling 35 acres were established and dropped from the proposed harvest units. The first survey for BLM Sensitive and Survey and Manage mollusks was conducted in all units in the Fall 2014 and Spring 2015. The Cascade axe tail slug, *Carinacauda stormi,* a BLM Sensitive species was found at two sites in Section 17 and one site in Section 21. Only one site is currently in the proposed units in 17A.

In the Fawn Two Area

Surveys for red tree voles were conducted in the summer of 2013 and 2014 and two active nests were found. Two reserves of 20 acres of potential treatment were dropped from the proposal. Two surveys for BLM Sensitive and Survey and Manage mollusk were conducted during the fall of 2013 and spring of 2014. None of these mollusk species were found.

Federally Listed Species

Threatened – Northern Spotted Owls

None of the proposed project units are located in 2012 Critical Habitat or unmapped Late Successional Reserves (LSRs), which are 100 acre core areas for known spotted owl sites as of January 1994. None of the units meet the stand level conditions characteristic of Recovery Action 32 Habitat according to the Northern Spotted Owl Recovery Plan (*NSO 2011 pp. III-67,68*).

In the Outer Limits area

The proposed units provide 81 acres of suitable habitat in the Middle North Santiam 5th field watershed. The suitability of the habitat for spotted owls in this area is marginal due to a lack of won CWD, large old-growth trees and snags for nesting and prey habitat.

There are two known spotted owl sites and one historic site within the provincial home range (PHR) radius (1.2 miles) of the Outer Limits area. The Monument Peak known spotted owl site was occupied by a pair during 2009, by a female in 2014,and a male and female in 2015. There were no spotted owl responses from 2010 through 2013. The Monument Peak site is considered viable, including Federal and State ownership, with a sufficient amount of suitable habitat available. Nesting was confirmed at this spotted owl site in 2001, with two juveniles fledged. Approximately 23 acres of unit 17B is within the core area (0.5 miles) of this site. Units 17A, 17B, 29E 29D and 29C are within the PHR of the site. There are no units or activities planned within or within disturbance range (0.25 miles) of the site.

The Kinney Creek known spotted owl site was occupied by a pair from its establishment in 1992 through 1997 and the site was not surveyed from 1998 to 2012. There were no spotted owl responses from 2013 and 2014. The Kinney Creek known spotted owl site is considered a viable site since it has sufficient amount of suitable available habitat in both PHR and core area. Unit 29C and 29D are within the PHR of the Kinney Creek Site. There are no units or activities planned within 0.5 miles or within disturbance range (0.25 miles) of the site.

In addition, one historical site has had no known occupancy during the last five years or more. "Circle" historical spotted owl site was located in the vicinity of unit 17A and 17B. The site was established in 2008 and had pair status for its first year and then went historic. The site is non-

viable due to a lack of suitable habitat. There is a long history of barred owl presence in the area. Barred owls are common and have been detected in all these spotted owl sites.

In the Fawn Two area

The Fawn Two project of 64 acres in the Little North Santiam 5th field watershed is considered suitable habitat for spotted owls. The habitat is suitable however it is marginal due to a lack of down CWD, large old-growth trees and snags for nesting and prey habitat.

There is one known spotted owl site adjacent to, but outside the PHR radius (1.2 miles) of the Fawn Two area. The Evan's Creek known owl site was last occupied by a resident single male in 2008. The last response from the male was in 2008. There have been no spotted owl responses during surveys since 2013. Occupancy by a pair has never been confirmed at the site. Barred owls have occupied the site since 2013.

BLM Sensitive and Survey and Manage

Red Tree Vole

The red tree vole is a Category C (uncommon pre-disturbance surveys practical) Survey and Manage species under the NWFP. It is an arboreal vole associated with conifer forests west of the Cascades summit, below about 3,500 feet. The project area is within the elevation range of the "Northern Mesic Zone" of the geographic distribution of this species.

In the Outer Limits area

Unit 17A and B meets the stand-level criteria as described in the Red Tree Vole Protocol (*Huff et al. 2012*). Surveys for red tree voles were conducted in all of the stands originally proposed for treatment that are 80 years of age and older (*IM-OR-2011-063 "2006 Pechman Exemptions," 2011*). A total of 35 trees were climbed, confirming the presence of 3 active red tree vole nests, and 3 inactive nests. As a result 35 acres of potential treatment area were dropped from the proposal. Red tree voles were found in units 10S-4E-17, and 21 (Section 21 later dropped from the proposal), and three habitat areas were established.

In the Fawn Two area

Units 25A and B meet the stand-level criteria as described in the Red Tree Vole Protocol (*Huff et al. 2012*). Originally, 230 acres of 80 year old plus stands in 4 separate survey areas were surveyed for red tree voles. A total of 19 trees were climbed, confirming the presence of 2 active red tree vole nests, and 1 inactive nest. As a result 20 acres of potential treatment area were dropped from the proposal. Currently, 63 acres out of the 230 acres originally considered for treatment remain.

Mollusks and Amphibians

Surveys for BLM Sensitive and Survey and Manage mollusks were conducted during the Spring and Fall of 2013 and 2014. No BLM Sensitive or Survey and Manage species were found in the Fawn Two area. One BLM Sensitive mollusk species was found in the Outer Limits area, the Cascade axe-tail slug, in section 10S-4E-17. A one-acre no entry area will be placed around the mollusk site to protect it from harvest and logging operations (*see EA Table 7 PDF#81*) .

Other Species of Management concern

Migratory and Resident Bird Species

There are no BLM Sensitive bird species documented or suspected to occur in the project area. The proposed project is located in the Western Oregon Cascades Physiographic Province. About 125 bird species are documented or suspected to nest on BLM lands in the Cascades RA (*Altman and Hagar 2007, Altman 2012, Marshall et al. 2003*), of which 36 species are priority bird species of conservation concern (*PIF 2012*). There are no BLM Sensitive bird species documented or suspected to occur in the Outer Limits area. The Partners in Flight (PIF) conservation plan, which addresses the Western Oregon Cascades, is the Conservation Strategy for Landbirds in Coniferous Forest of Western Oregon and Washington (*Altman 2012*).

Some recent studies have correlated bird species richness at the stand level with habitat patchiness, densities of snags, and density by size-class of conifers (*Hagar, McComb, and Emmingham 1996, Hansen et al. 1995*). Even-aged conifer stands provide habitat for a relatively high abundance of a few bird species, many of which feed on insects gleaned from conifer foliage. The most common species include chestnut-backed chickadee, Pacific-slope flycatcher, hermit warbler, golden-crowned kinglet, varied thrush, winter wren, red-breasted nuthatch, and Swainson's thrush.

The proposed harvest areas are in a late mid, early mature or mature stands which were either naturally regenerated from fire and past harvest, or were previously thinned, leaving stands characterized by lack of hard snags and CWD, and a lack of well-developed understories and ground cover. The understory vegetation in both areas does not provide for as diverse of a community of shrub and ground cover plant species that are important in providing insect and plant food resources for bird species (*Hagar 2004*). Although lacking in the stands proposed for treatment, adjacent stands contain hardwoods and thinned areas which provide better developed understories.

Bats

There are no BLM Sensitive bat species suspected to occur in the project area, however four bat species of concern are suspected to occur (silver-haired bat, long-eared myotis, long-legged myotis, and Yuma myotis). These species are associated with caves and mines, bridges, buildings, and cliff habitat. Decadent live trees and large snags with bark attached that extend above the tree canopy are used as solitary roosts, maternity roosts, and hibernacula by these species and other bat species associated with Douglas-fir forests (*Christy and West 1993, Weller and Zabel 2001, Waldien et al. 2000*). None of these features are present in the project areas.

Big Game

Big game species found in the vicinity include Roosevelt elk (*Cervus elaphus roosevelti*) and black-tailed deer (*Odocoileus hemionus*). The stand proposed for thinning is in early mature and late mid seral habitat located at middle elevations some on southerly aspects, which provides hiding and high quality thermal cover, but lacks high quality forage due to poorly a developed ground cover. The Salem District RMP identified no critical winter or summer range in the project areas (*RMP p.26*). In Fawn Two there is big game use throughout the year due to the area's location below the seasonal snow zone. In Outer limits, big game use is seasonal due to the areas high elevation and location above the snow zone.

3.3.5.2 Environmental Effects

Proposed Action- Regeneration harvest

Habitat Structure, Snags and Coarse Woody Debris

As a wildlife design feature, 15 – 22 of the largest green trees would be retained for the recruitment of standing dead/down CWD and development of a large green tree component in future stands. Any remnant or legacy trees within the stands would be retained.

Regeneration harvest could convert 79 acres of early mature and mature forested habitat in the North Santiam 5th field watershed to open early-seral stage habitat. This conversion would adversely affect late-successional associated species. Late-successional habitat conditions in the regeneration harvest units would not be achieved again until the stands develop in size, (estimated to be 70 to 80 years). The adverse effects of regeneration harvest on wildlife habitat include:

- Removal of canopy cover;
- Loss of standing snags;
- Reduction of understory and ground cover vegetation;
- Fragmentation of remaining late-successional habitat

The conversion of this habitat would positively affect early-successional associated species including some Neotropical Migratory birds and foraging big game species such as deer and elk. In the short term, there would be an increase in herbaceous vegetation, deciduous shrubs and early-seral habitat.

Within regeneration harvest units, there would be a loss of existing standing dead snags. Up to 90 percent of standing material could be lost or fall incidental to felling for safety, yarding, and site preparation activities. Snags which are small diameter, tall relative to their diameter, and/or in more advanced stages of decay are highly likely to be felled or knocked over during falling, yarding and site preparation. These snags typically constitute a large portion of the total number of snags in a stand. A snag's strength and likelihood of remaining standing after operations are complete increases geometrically with increasing diameter. Shorter snags with less decay also remain intact in higher percentages than tall, unstable and/or decaying snags. Overall, based on casual observations of regeneration harvest units completed 10-20 years ago it is likely that a relatively high percentage of sound snags larger than 15 inches diameter would remain standing, but BLM has no data or recent experience with regeneration harvest on which to base precise estimates.

Habitat for species such as the pileated woodpecker, which use snags in late successional habitat, would be adversely impacted. Conversely, habitat would improve for species such as the western bluebird that utilize snags in more open environments. Loss of snags would be a loss of existing habitat features for primary excavators (woodpeckers), and secondary cavity users, such as some songbirds, bats and small mammals within the harvest units. There would be a loss of cover around the surviving standing material, leaving them more exposed in an open environment

Microhabitat drying and direct impacts to existing snags and CWD due to logging and site preparation activities are anticipated within and, to a lesser extent, around the perimeter edge of the harvest units. Microhabitat drying due to the loss of canopy cover would make existing CWD and snags less suitable for wildlife species that utilize this material. Large diameter CWD in advanced decay condition (decay class 3 to 5) would persist as the canopy closes and contribute to forest-floor wildlife habitat conditions for many decades before becoming unrecognizable as down logs.

Broadcast burning could result in the loss of additional standing dead material and charring of down CWD, depending upon the timing and intensity of the burn. Some damage to green trees left for recruitment of snags and down CWD would occur. Some trees may die as a result of broadcast burning, which would contribute to snags and CWD in the future life of the stand.

Any snag felled or that falls incidental to operations would be retained on site as CWD. This CWD would provide important habitat for a key group of dead-wood associated species (*Aubry 2000, Bowman et al. 2000, Butts and McComb 2000*). Management direction for the Matrix LUA is to provide a renewable supply of snags and down logs well-distributed across the landscape (*RMP p. 21*). Additional green trees over and above the 12 to 18 required would be left to compensate for snag deficit conditions. In the long term, green tree retention, snag and CWD recruitment would introduce this type of material, thus increasing stand structure for the future life of the stand. Snag densities and CWD levels would approach NWFP standards in one to three decades, with snag and CWD creation.

Mollusks and Amphibians

Treatment should retain high quality habitat for these species, including vine maple and down woody debris, as well as the needle-duff layer (*Young and Doerr 2010*).

Special Status Species, Survey and Manage Species, and Species of Management Concern

Northern Spotted Owl- Federally Listed Species

Refer to Table 23 for a summary of the Outer Limits/Fawn Two Proposed Action and its effects on spotted owl habitat.

In the Outer Limits area

The Outer Limits regeneration harvest may affect, and is not likely to adversely affect, the spotted owl due to the removal of 16 acres of dispersal habitat. Dispersal habitat would be converted to young early-seral stage capable habitat (*Table 4 definitions*). Suitable spotted owl habitat conditions in the regeneration harvest units would not be achieved again for 80 years.

The Outer Limits regeneration harvest is within the provincial home range radius of the Monument Peak known spotted owl sites. The current average diameter of the stand is 10.9 inches. The Willamette Physiographic Region Biological Assessment for Habitat Modification (NLAA) FY2014 defined dispersal habitat as stands that have conifer trees over 11 inches average diameter. It is unlikely that this stand is used for dispersal or foraging for the owls at this site, based on the size of trees and habitat quality.

The Outer Limits area is in compliance with the new Final Recovery Plan for the Northern Spotted Owl (*USFWS 2011*). The habitat is not located in LSR or critical habitat, and does not meet the criteria for Recovery Action 10 or Recovery Action 32. No Incidental Take of spotted owls is expected to occur as a result of regeneration harvest.

In the Fawn Two area

The Fawn Two regeneration harvest may affect, and is likely to adversely affect, the spotted owl due to the removal of 64 acres of suitable habitat. Suitable habitat would be converted to young early-seral stage capable habitat (*Table 14 definitions*). Suitable spotted owl habitat conditions in the regeneration harvest units would not be achieved again for 70 to 80 years.

The Fawn Two regeneration harvest is not within the PHR radius of any known spotted owl sites. The Fawn Two area is in compliance with the new Final Recovery Plan for the Northern Spotted Owl (*USFWS 2011*). The habitat is not located in LSR or critical habitat, and does not meet the criteria for Recovery Action 10 or Recovery Action 32. No Incidental Take of spotted owls is expected to occur as a result of regeneration harvest. Current surveys show no spotted owl presence in the Fawn Two area or vicinity. There are no actual spotted owls that would be "harmed" by the action and thus the biological opinion (*pp.133-134*) did not issue any "take" of spotted owls associated with this project.

Table 23. **Spotted Owl Habitat Modification by Treatment type, Land Use Allocation, Pre/Post Treatment Habitat Type, Habitat Modification Type, and Effect Determination: <u>Proposed Action</u>**

5th. Field Watershed	Area	Township-Range-Section#	Proposed Treatment[1]	Acres	Land Use Allocation	Pre/Post Treatment Habitat Type[2]	Habitat Modification[3]	Effect[4]
Middle North Santiam	Outer Limits	10S-4E-17	Regeneration	16	Matrix	Dispersal/Capable	Remove	NLAA
North Santiam	Outer Limits	10S-4E-29	moderate thin	208	Matrix/ RR	Dispersal/Dispersal	Maintain	NLAA
North Santiam	Outer Limits	10S-4E-17	moderate thin	83	Matrix/RR	Suitable/Suitable	Maintain	NLAA
Little North Santiam	Fawn Two	8S-3E-25	Regeneration	64	Matrix	Suitable/Capable	Remove	LAA
TOTAL				**371***				

*total includes 3 acres of ROW (see Table 4, 5)

Notes and definitions for Table 24 (*BA pp. 2-3, 4; BO pp. 9-10, 17-19*).

1 Treatment Type:

Regeneration harvest is the removal of most or all of the overstory. The only remaining standing trees would be retained green trees, snags, or coarse woody debris recruitment trees. The habitat lost is canopy cover, roosting and nesting trees, foraging areas, and some large down woody material.

2 Land Use Allocations: GFMA=General Forest Management Area Matrix.

3 Habitat Types:

Capable Habitat consists of habitats that are capable of producing suitable northern spotted owl habitat in the future, regardless of current habitat. In the case of Fawn Two, suitable habitat would be removed, converting the suitable habitat to non-habitat that is capable of becoming suitable habitat again in 70 to 80 years.

Dispersal Habitat consists of conifer and mixed mature conifer-hardwood habitats with a canopy cover greater than or equal to 40 percent and conifer trees greater than or equal to 11 inches average diameter at breast height (DBH). Generally, spotted owls use dispersal habitat to move between blocks of suitable habitat, roost, forage and survive until they can establish a nest territory. Juvenile owls also use dispersal habitat to move from natal areas. Dispersal only habitat lacks the optimal structural characteristics needed for nesting.

Suitable habitat consists of forested stands used by spotted owls for nesting, roosting and foraging (NRF). Generally, these stands are conifer-dominated, 80 years old or older, and multi-storied in structure, and have sufficient snags and down wood to provide opportunities for owl nesting, roosting and foraging. The canopy closure generally exceeds 60 percent. Suitable habitat also functions as dispersal habitat.

4 Habitat Modifications:

Remove refers to Silviculture activities that alter spotted owl suitable habitat such that the habitat no longer supports nesting, roosting, foraging, and dispersal. In the case of Outer Limits/Fawn Two, removal of suitable habitat means to alter suitable habitat to capable non-habitat.

Survey and Manage Species

Red Tree Vole

There would be a loss of 16 acres of marginally suitable red tree vole habitat in the Middle North Santiam 5th field watershed and a loss of 64 acres of suitable red tree vole habitat in the Little North Santiam 5th field watershed as a result of regeneration harvest. The stands were surveyed for red tree voles and none were found in Outer Limits, while 2 active nests and one inactive nest were found in Fawn Two. In the short term, undetected nest sites within suitable habitat could be damaged or destroyed during logging activities. Green tree retention would be concentrated on leaving larger diameter trees.

Other Species of Concern

Migratory and Resident Birds

Habitat modification activities that disturb vegetation may unintentionally take birds, eggs and nestlings during the nesting season. A seasonal restriction for nesting birds has been recommended from April 1 to July 15. If habitat modification activities are avoided during this window, unintentional take would be greatly reduced (*Altman, Hagar 2007*).

Broadcast burning could result in unintentional take of birds, eggs and nestlings if it occurs during the nesting season. Burning would occur after habitat modification activities (felling and yarding) are complete. Impacts would be limited to birds that nest on the ground, in highly disturbed slash and debris remaining after logging.

Regeneration harvest of mature conifer stands would be expected to immediately decrease habitat suitability for species which prefer late-successional conditions for nesting, foraging, and/or roosting. Removing mature forests is expected to have negative long term effects on nesting for the black-throated gray warbler, brown creeper, chestnut-backed chickadee, Cooper's hawk, golden-crowned kinglet, Hammond's flycatcher, hermit warbler, northern goshawk, northern pygmy-owl, northern saw-whet owl, pileated woodpecker, red-breasted sapsucker, red crossbill, varied thrush, Vaux's swift, and winter wren. Individuals of these species may be displaced from regeneration treatment areas, but would find refugia in nearby untreated stands.

In the long term, late-successional habitat conditions in the regeneration harvest units would not be achieved again for 70 to 80 years.

Regeneration harvest would increase habitat suitability for species that prefer early-seral conditions, edge habitat, and openings in the forest environment. Species of Conservation Concern that would benefit from regeneration harvest include the common nighthawk, MacGillivray's warbler, orange-crowned warbler, rufous hummingbird, spotted towhee, western bluebird and willow flycatcher.

Bird diversity in Pacific Northwest conifer forests is usually higher in regenerating stands that have early-successional vegetation combined with some mature overstory trees than in intact mature forest or clearcuts without residual structure (*Hansen and Hounihan 1996*). The olive-sided flycatcher would benefit from the development of a two-storied stand in the future. Overall bird species richness (a combination of species diversity and abundance) would increase due to greater foraging opportunity for a greater number of species.

Bats

There would be a loss of 79 acres of early mature and mature seral habitat, which would be converted to early seral habitat for foraging bats. There would be a loss of up to 90 percent of the existing snags within the proposed unit due to logging and site preparation activities. Microhabitat drying and direct impacts to existing snags are anticipated within and around the perimeter edge of the harvest units. However, the habitat quality for bats is poor due to the lack of suitable snags and other primary habitat features for bats. The four bat species of concern suspected to occur in the project area are associated with caves and mines, bridges, buildings and cliffs. These habitat features are not present in the stand proposed for treatment. Decadent live trees, and large snags with sloughing bark, especially those that extend above the stand canopy, are also used by bats. There are few snags within the proposed unit and no large snags with sloughing bark. Late-successional forests with abundant large snags and decadent trees provide higher quality roost sites than younger forests, and many bat species prefer older forests (*Thomas and West 1991, Perkins and Cross 1988*).

Big Game

There would be a loss of 79 acres of thermal and hiding cover, which would be converted to early successional foraging habitat as a result of timber harvest. Vegetative forage such as saplings, shrubs, grasses and forbs would increase as a result of regeneration harvest. Broadcast burning is expected to further increase the quantity and quality of the forage. An increased vegetative response is anticipated as a result of burning, and this initial flush of vegetation would last up to three years. As a result of increased light and burning, forage quantity and quality would increase and attract foraging elk and deer to the treated areas.

In the short term, big game species would be disturbed during the implementation of the Proposed Action. Logging equipment noise and human presence may cause animals to avoid or disperse from the project areas temporarily. In the longer term, the road system into the Outer Limits area is consistently gated which greatly reduces the disturbance factors in the area.

In the long term (10+ years), thermal and hiding cover quality would gradually increase, and vegetative forage would gradually decrease as a result of canopy closure decreasing the amount of light reaching the forest floor with the development of a young vigorous stand.

Cumulative Effects of Regeneration Harvest under the Proposed Action

Late-Successional Habitat

The amount and distribution of late-successional forest habitat affects many wildlife habitats including snags, CWD, and old-growth remnants. Most of the Special Status species and species of concern addressed in the EA are associated with late-successional habitat. These include the Northern spotted owl (spotted owl), red tree vole, many bat species, and some of the priority bird species.

In the Outer Limits area, the stand proposed for regeneration harvest is currently not functioning as late successional habitat. Regeneration harvest of this stand should have no effect on late successional habitat in the watershed.

In the Fawn Two area, the Proposed Action, and other planned projects in the foreseeable future, would retain more than 44 percent of late-successional habitat on federal lands in the Little North Santiam 5th field watershed after implementation (*NWFP p. C-44; RMP p. 25*).

The Little North Santiam 5th field watershed is 72,190 acres and the BLM manages approximately 13,255 (18 percent) of the watershed. The remaining 82 percent of the watershed is managed primarily by the USFS (50 percent), Private (29 percent) and the State of Oregon (3 percent). The private lands are managed for forestry purposes according to the Oregon Forest Practices Act (OFPA), and late successional habitat on non-federal lands are not expected to persist in the long term (20+ years). In the future, the average rotation ages when final harvest would occur would be less than the stand ages necessary to attain late-successional conditions. For these reasons, private lands would not contribute to late-successional conditions in the future. Currently, late successional forest comprises 69 percent of the federal ownership in the 5th field watershed. The Fawn Two project proposed to regeneration harvest 63 acres (<0.2 percent) of late successional forests on Federal lands.

Fawn Two is located in the Upper Little North Santiam 6th field watershed, which is 19,192 acres in size, and contains 5,616 acres (29 percent) of BLM lands. Currently, late successional forest comprises 52 percent of the BLM ownership in the watershed. The project proposes to regeneration harvest about 2 percent of these late successional forests on BLM lands in the 6th field watershed.

Snags, Down Logs (CWD) and Remnants

Since these components are most abundant and closely associated with late-successional habitat, cumulative effects to these components follow closely the cumulative effects to late-successional habitat. Snags and CWD on the late successional habitat on Federal lands in the Middle North Santiam 5th field watershed (Outer Limits) would remain. However, some negative cumulative effects to snags, CWD and associated species are expected more at the local level. In the Outer Limits area, the size of the CWD and snags in the regeneration harvest stand are small, will exist for shorter period of time, and are used less by Wildlife.

Snags and CWD on over 99 percent the late successional habitat on Federal lands in the Little North Santiam 5th field watershed (Fawn Two) would remain. At the site-specific scale, 93 percent of the snags and CWD would remain undisturbed in the contiguous BLM parcel where the Fawn Two regeneration harvest would occur.

Special Status Species, Survey and Manage Species, and Species of Management concern

Northern Spotted Owl – Federally Listed Species

Cumulative effects to spotted owls and their habitat were analyzed at the watershed level and are contained in the pertinent watershed analyses (*LNFWA Ch. 5 pp. 18-21; Ch. 6 pp. 8-9; Ch. 7 p. 1, NSWA Ch. 3 p. 6).*

Cumulative effects to spotted owls and their habitat were analyzed thoroughly at multiple scales during the 2015 consultation process, including the current Environmental Baseline (*Biological Assessment (BA) pp.16-23; Biological Opinion (BO) pp. 34-45),* and Cumulative Habitat Effects Summary (*BA p. 122; BO p. 131-132*). Unit Specific Data, including the environmental baseline and effects of proposed projects that are likely to adversely affect spotted owls, are summarized by Administrative Units in the Willamette Province (*BA pp. 131-197; BO pp. 145-221*), including the Cascades RA where the Outer Limits/Fawn Two Project is located (*BA pp. 157-170; BO pp. 175-191*).

The BO issued by the USFWS concurred with the analysis in the BA that the combined effects to spotted owl habitat and populations of all of the actions proposed in the Willamette Province (including the Outer Limits/Fawn Two Project) are not likely to jeopardize the continued existence of the spotted owl and are not likely to adversely modify spotted owl critical habitat, and would not likely diminish the effectiveness of the conservation program established under the NWFP to protect the spotted owl and its habitat (*BO p. 132*).

In the Outer Limits area

The Proposed Action would not contribute to the cumulative effects to spotted owls and would have minimal cumulative effects on spotted owl habitat. The proposed regeneration harvest unit offers limited value habitat due to the small diameter of the trees (average diameter of 10.9 inches) and simple stand structure.

The Outer Limits area is viable for posted owl dispersal, however, movement within the area is inhibited by the North Santiam River Corridor (*NSWA Ch. 3, p. 6*). Harvest would occur within the PHR of a known spotted owl site and dispersal habitat would be maintained between known spotted owl sites.

In the Fawn Two area

The proposed regeneration harvest in the Fawn Two area would not contribute to the cumulative effects to spotted owls and would have minimal cumulative effects on spotted owl habitat. The Fawn Two area offers limited value habitat due to scattered Federal ownership and lack of older forest on the western portion of the watershed. The watershed is approximately 24 miles long and the project area is 11 miles from the western boundary. The western half of the Little North Santiam 5th field watershed was found not be critical for the dispersal of spotted owls within the Cascades Physiographic province (*LNFWA Ch. 7, p. 2*). No harvest would occur within the PHR of any know spotted owl sites and dispersal habitat would be maintained between spotted owl sites and LSRs.

Survey and Manage

Red Tree Vole

In the Outer Limits area

Due to harvest of early mature forest habitat in the Middle North Santiam 5th field watershed, there would be minor local effects to the red tree vole. The stand proposed for regeneration harvest lacks structure for red tree voles and any harvest would not result in the loss of late successional forest on Federal lands in the watershed.

In the Fawn Two area

Due to the mature forest habitat in the Little North Santiam 5th field watershed, there could be local effects to the red tree vole. The cumulative effect on late successional forest habitat for these species was analyzed at various scales. The proposed regeneration harvest would result in the loss of less than one percent of the late-successional forest on federal lands within the watershed. After harvest, the watershed would remain above the late successional habitat guidelines after implementation (*NWFP p. C-44; RMP p. 25*)

Other Species of Concern

Migratory and Resident Birds

As a result of the harvest of early mature and mature forested habitat, habitat fragmentation would occur and priority species which prefer closed canopy forested habitat would be affected at the local level. Other priority species which prefer early successional habitat and open areas and edges would benefit from regeneration harvest of mature forest. At the various watershed levels analyzed and at the regional scale, the proposed action would not reduce the persistence of any priority bird species**.** Analysis shows that early successional habitat is lacking on BLM lands in the watershed, particularly early seral less than ten years of age.

Bats

Cumulative effects to bats would be low and follow closely the cumulative effects to snag and late successional habitat. Habitat quality for bats is poor due to the lack of suitable snags and other primary habitat features for bats.

Big Game

As a result of the harvest of early mature and mature forested habitat, cover would be converted to open forage areas at the local level. Thermal and hiding cover would become early successional habitat which would provide forage and edge habitat for big game. Broadcast burning would improve the quality of the forage habitat. At the various watershed levels analyzed, the Proposed Action would result in minimal cumulative effects.

In conclusion, this project would not contribute to the need to list any BLM Sensitive species or species of concern under the ESA (BLM 6840) because late-successional habitat would remain at the site-specific scale, sub-watershed scale, the watershed level, the provincial scale, and the regional scale.

Proposed Action – Thinning in the Outer Limits area

Under the Proposed Action, thinning would take place in the Outer Limits area, with the exception of the 16 acres of regeneration harvest in 17A.

The Proposed Action includes one, three acre low density thinning patch in Section 29. This opening would increase understory layering, structural diversity and ground cover, adding complexity at both the forest stand and landscape levels. Species expected to benefit from low density thinning patches are ruffed grouse, Wilson's warbler, warbling vireo, song sparrow and big game species.

Snags, Down Logs (CWD), Remnants and Special Habitats

Thinning these stands would reduce the number of small diameter (less than 15 inches DBH) snags over the next 10 to 30 years because thinning from below removes the smaller suppressed and intermediate trees that would otherwise die from suppression mortality and become snags within that time period. Also, some of the existing smaller diameter/taller snags (between 9 and 15 inches DBH and greater than 25 feet tall) would be felled for safety reasons or fall incidental to thinning operations. These smaller snags have less value for wildlife species than the larger material over 15 inches (*Rose et al. 2001*). Within thinning units, snags over 15 inches diameter would be retained as much as feasible during harvest and more will remain after treatment, retaining the best available habitat.

In unmanaged forests, the presence of cavity nesting birds has been linked to the presence of snags, particularly greater than 50 cm (19.26") (*Carey et al. 1991, Huff and Raley 1991*). Snag associated species such as chestnut backed chickadees, red breasted nuthatches, brown creepers and hairy woodpeckers have shown selectivity to foraging habitats based on deciduous trees, large diameter conifers, and large diameter heavy decayed snags and logs (*Weikel and Hayes 1999*).

Up to two trees per acre would become snags or down logs through logging where leave tree damage occurs and reserve trees are felled and left to facilitate logging. All felled snags and reserve trees would remain on-site as down CWD, providing important habitat for dead wood associated species.

Small dead wood created through suppression mortality would be abundant in adjacent untreated areas. There would be an abundance of untreated areas to provide small dead wood from suppression mortality (*see EA Table 5*).

Throughout the project area, approximately 48 to 118 green trees per acre would be retained for green trees and recruitment of snags and down logs in the future stands (*RMP p. 25*). As a result of thinning, growth of residual live trees would accelerate, so that larger trees would be available sooner for recruitment as snags and down logs than without thinning.

Existing large diameter down logs in more advanced decay conditions would persist and contribute to forest floor wildlife habitat conditions for many decades before passing through decay class five to become unrecognizable as down logs. It is anticipated that less than ten percent of existing down CWD would be directly impacted by logging. Less than ten percent of the thinning area would be directly impacted by skidding/yarding, which is the operation with the highest potential impact to existing CWD. BLM oversight of skyline corridor and skid trail locations would avoid impact to high value CWD wherever feasible.

There would be no effects to old-growth remnants since the proposed units lack these structures.

As a result of increased growth rates of retained trees and snag/CWD creation, the RMP guidelines for snags (40 percent maximum population densities) and down logs (240 plus linear feet per acre of material in decay classes 1 or 2, at least 20 inches in diameter at the large end, and 20 feet in length) in the Matrix could be met in one to three decades.

Special Status Species, Survey and Manage Species, and Species of Management Concern

Northern Spotted Owl – Federally Listed Species

Thinning approximately 97 acres of suitable habitat in the Outer Limits area may affect, and is not likely to adversely affect the spotted owl due to maintaining suitable habitat. The units are not located in 2012 Critical Habitat or unmapped LSRs, which are 100 acre core areas for known spotted owl sites as of January 1994.

The Outer Limits proposal is consistent with the Revised Northern Spotted Owl Recovery Plan (NSO 2011) and conforms with Recovery Actions 10 and 32. Recovery Action 10 recommends conserving existing known spotted owl sites with high value habitat (*NSO 2011 p. III-43*). Harvest would occur within the provincial home range radius (1.2 miles) of any known active spotted owl site. Spotted owl habitat will be maintained by keeping at least 60 percent canopy cover, in a light to moderate thin. Recovery Action 32 recommends land managers maintain high quality suitable habitat. Since the proposed units do not meet the stand level conditions characteristic of Recovery Action 32 Habitat (*NSO p. III-67*), no Recovery Action 32 habitat would be altered.

The short-term effect of thinning will be maintaining 97 acres of suitable and 208 acres of dispersal habitat (*see EA Table 23*). "Maintain" habitat means thinning in which forest stand characteristics are altered but the components of spotted owl habitat are maintained such that spotted owl life history requirements are supported. For maintaining spotted owl habitat in suitable and dispersal, respectively, a canopy cover of over 60 percent over 40 percent along with other habitat elements (e.g. including snags, down wood, tree-height class-diversity, and older hardwoods) will be maintained post treatment to adequately provide for spotted owl dispersal.

As the thinned stand grows, habitat conditions would improve. Canopy closures would increase and the stand could improve suitable habitat conditions within 10 to 30 years. Subsequent treatments to create snags and down logs would help move these stands toward suitable habitat conditions.

Survey and Manage

Red Tree Vole

The stands were surveyed for red tree voles, and two active nests and one inactive nest were found (*see Table 7, PDF# 80*). The habitat is considered to be marginal however it is suitable for red tree voles. In the short-term, undetected nests could be destroyed or disturbed during thinning. Thinning can temporarily inhibit dispersal and make habitat less suitable because of wider spacing between crowns (*Hayes et al. 1997*). After thinning, stand conditions would improve over time as canopies close.

Other Species of Concern

Mollusk Species

Surveys for Bureau Sensitive and Survey and Manage mollusks were conducted during the Spring and Fall of 2014. One Bureau Sensitive mollusk species was found, Cascade axe-tail slug, in section 10S-4E-17. The mollusk site will not be affected due to a one acre no-harvest buffer (*see Table 7, PDF# 81*).

Migratory and Resident Birds

Unintentional take of nests, eggs, nestlings and nesting failure could occur if harvest operations occur during active nesting periods. In the western Oregon Cascades there is temporal variability of breeding bird species and individuals of the same species in forested habitats. For example, some owls and woodpeckers begin breeding in February or March, while some flycatchers do not finish breeding until August. The majority of birds in the Pacific Northwest complete their breeding cycle within the April 15 to July 31 time period (*Altman, Hagar 2007*). This is the critical breeding period for >90% of individuals and >90% of the bird species, and the greatest amount of take would occur if habitat modification occurs during these times (*Altman, Hagar 2007*).

The effects of thinning would be short term, and would not reduce the persistence of any bird species in the watershed or populations at the regional scale. Some individual birds may be displaced during harvest operations in the project area due to disturbance. Adjacent untreated areas and areas where active operations are not occurring would provide refuge, which would minimize short-term disturbance.

Changes in habitat structure would have immediate effects on bird communities in thinned stands. Thinning would immediately enhance habitat suitability for species which prefer a less dense conifer canopy, and reduce habitat suitability for species that prefer more continuous conifer canopies. Reducing the canopy closure and opening up stands is expected to have short term negative effects on the brown creeper, golden-crowned kinglet, hermit warbler, Pacific-slope flycatcher and varied thrush. Thinning would have positive long-term effects on this same set of species as understories develop and habitat quality improves.

Overall bird species richness (a combination of species diversity and abundance) would gradually increase as hardwood components develop, plant species composition becomes more complex, and hardwood shrub layers, epiphyte cover, and snag density become more prominent within the stands. The future development of hardwood/deciduous tree/bush components and canopy layers would favor species such as the band-tailed pigeon, ruffed grouse, red-breasted sapsucker, Wilson's warbler, Hutton's Vireo and black-throated gray warbler. The low density thinning patches would encourage the development of hardwood/deciduous tree/shrub components and canopy layers more rapidly and would further benefit this same set of species.

Bats

Adverse impacts to bat species would be low. Old-growth forests provide higher quality roost sites than younger forests, and many species prefer older forests (*Thomas and West 1991, Perkins and Cross 1988*). There are few snags within the units proposed for thinning (*see EA Table 2*). Bat activity appears to be higher in thinned versus unthinned stands. Structural changes in stands caused by thinning may benefit bats by creating habitat structure in young stands that bats are able to use more effectively (*Humes, Hayes, Collopy 1999*). Bat species are

also associated with buildings, bridges, mines, cliff crevices and caves. None of these features are present in the project area.

Big Game

Big game species would be temporarily disturbed during the implementation of the proposed thinning. Logging equipment noise and human presence may cause animals to avoid or disperse from the project area during times of operation. Thermal and hiding cover quality would decrease in the short-term as a result of thinning, opening new roads, renovating roads and road improvements (*Cole et al. 1997, Trombulak and Frissell 1999*). Saplings and vegetative forage such as shrubs, grasses and forbs would increase because of thinning and road closures after thinning. As a result of increased light, forage quantity would increase and attract early successional species such as elk and deer to the thinned areas. This response of early seral plant species would be especially evident in the low density thinning areas.

In the long term (five plus years), thermal and hiding cover quality would increase and vegetative forage would gradually decrease as a result of canopy closure, decreasing the amount of light reaching the forest floor. Vegetative forage would persist longer in low density thinning areas.

Cumulative Effects of Thinning in the Proposed Action

Late-Successional Habitat

Outer Limits area is located in the Middle North Santiam 5th field watershed; most of the thinning that has occurred, or is planned for the foreseeable future is targeted for mid seral stands 40 to 75 years of age (*see EA Section 1.3.1.1, Table 2, EA Section 3.2*).

The Middle North Santiam 5th field watershed is 56,698 acres and the USFS and the BLM manage about 6,776 (12 percent) of the watershed. The remaining 88 percent of the watershed is managed primarily by private industry. Currently, mature and old-growth forests comprise 36 percent of the Federal ownership. The Outer Limits/Fawn Two Proposed Action includes thinning 307 (<2 percent) of late-successional forests on BLM lands.

Snags, Down Logs (CWD) and Remnants

Thinning these stands would reduce the number of small diameter (less than 15 inches DBH) snags over the next 10 to 30 years that would otherwise die from suppression mortality and become snags. In the Middle North Santiam basin 85 percent of the late mid and early mature stands will not be treated with this project. Small dead wood would still be present and available in adjacent untreated areas. PDFs would retain existing down logs 20+ inches and snags 15+ inches diameter (*see EA Table 7*). Any snag that falls for any reason as a result of thinning operations would remain on-site to become down CWD, providing important habitat for a different, but also key group of dead-wood associated species (*Aubry 2000, Bowman et al. 2000, Butts and McComb 2000*).

Up to two trees per acre would become snags or down logs through logging where leave tree damage occurs and reserve trees are felled and left to facilitate logging.

Beneficial long term cumulative effects to larger CWD and associated wildlife species would occur as a result of implementing the project, since larger trees would be available sooner than without thinning to contribute additional large snags and CWD recruitment in future stands. As larger trees develop in the residual stands, they would provide source material for girdling and topping.

Special Status Species, Survey and Manage Species, and Species of Management Concern

The Proposed Action would not contribute to cumulative effects to any Special Status or Survey and Manage Wildlife species. Bureau Sensitive and Survey and Manage species have been found during surveys of the area. The sites will be buffered to create skips where these species were found to be present. A high percentage of similar habitat in the watershed would remain untreated and high quality suitable habitat for Special Status/Survey and Manage species would remain intact. Implementation of the project would not eliminate connectivity between adjacent untreated stands under BLM management.

Northern Spotted Owl – Federally Listed Species

The scale for cumulative effects for the spotted owl is the home range of known spotted owl sites (*BA, pp. 3-4; BO, pp. 17-18*) and the location of the project in relationship to adjacent known spotted owl sites and LSRs. The scale was chosen because the NWFP for conservation and recovery for spotted owls prescribes maintaining suitable owl habitat within LSRs, the PHR of known owl sites, and dispersal habitat between LSRs and known owl sites. The Proposed Action would maintain dispersal habitat within and between known owl sites, and no harvest would occur in LSRs, Recovery Action 10 or Recovery Action 32 habitat.

Harvest would occur within the PHR of a known spotted owl sites and suitable and dispersal habitat would be maintained in these known spotted owl sites. Therefore, the Proposed Action would not contribute to cumulative effects to spotted owls.

Migratory and Resident Birds

No cumulative effects to birds are expected. The Proposed Action would not reduce the persistence of any bird species in the watershed or populations at the regional scale. Habitat changes resulting from the Proposed Action would not change seral stage habitat or change any patch size, and therefore would not contribute to fragmentation of bird habitat. Thinning would not contribute to a fundamental change in the species composition of existing bird communities within the watershed. In the long term, the thinning could have the potential to improve habitat for bird species as this stand continues to mature, resulting in greater bird species diversity.

Bats

Cumulative effects to bats would be low and follow closely the cumulative effects to snag and late successional habitat. Habitat quality for bats is poor due to the lack of suitable snags and other primary habitat features for bats.

Big Game

No adverse cumulative effects to big game species populations are expected. The Proposed Action would not change any forest cover type or change any habitat patch size. Therefore, thermal and hiding cover present before treatment would be maintained after harvest. Variable

density thinning, including low density thinning areas, is expected to improve the quality of forage and cover both in the short and long term.

In conclusion, thinning in the project areas would not be expected to contribute to the need to list any Bureau Sensitive species or species of concern under the ESA (BLM 6840). Habitat for the species that are known to occur in the watershed would be maintained, habitat connectivity would not be changed, any habitat alteration would have only short-term negative effects, and long-term effects could be beneficial.

Alternative Action

Under the Alternative Action, thinning would take place in all the Outer Limits area, and a proportion-thinning treatment would be implemented in the Fawn Two area (*see EA Section 2.3.2*).

The proposed treatment will have both short (less than five years) and long term (more than five years) effects. In the short term, thinning would result in a reduction of suppression mortality, canopy cover, and understory and ground vegetation. In the longer term, there are trade-offs in terms of a loss of smaller diameter suppression mortality that would occur without thinning versus an increase in stand complexity as a result of thinning. While thinning these stands would reduce the number of small diameter (less than 15 inches DBH) snags that would otherwise die from suppression mortality, there would be an increase in understory development, crown structure and growth of the residuals. The long-term effect of thinning would be increased canopy structure, tree diameters, spacing of the leave trees, understory and ground cover development. Stand conditions and structural complexity would improve as canopies close and thus improve habitat quality for mid to late successional wildlife species.

Research that has occurred since the 1980s has determined that it is possible to develop desired structural and compositional diversity in managed stands through specific actions (*Bailey and Tappeiner 1997, Chan et al. 2006).* Thinning forest stands reduces competition between the remaining overstory trees and increases the availability of solar radiation to the forest floor (*Hayes, Weikel and Huso 2003*). Growth, size, branch diameter, and crown ratio of the remaining trees is increased, and development of understory and ground cover vegetation is stimulated. These changes effectively increase structural complexity and alter habitat quality. The increase in structural diversity would improve habitat for many species by providing more opportunities for foraging, nesting/breeding, resting, hiding and escape cover/habitat for a variety of species in the forest environment, including invertebrates, songbirds, and small mammal species.

Proposed road construction, skid trails and skyline corridors under the Alternative Action would create narrow linear openings through the vegetation, disturbing, reducing or removing ground vegetation and creating breaks in the canopy, which would allow more light to reach the forest floor. The effects on wildlife habitat would be a short-term disturbance and reduction in ground vegetation and canopy closure that would increase access to the stand by certain wildlife species, specifically larger mammals such as big game, coyotes, and avian predators. In the long-term, ground vegetation would become re-established due to increased light to the forest floor and the breaks in the canopy would close.

All thinning in the Outer Limits area

Thinning in all of the Outer Limits area under the Alternative Action would have effects similar to the Proposed Action for wildlife and associated habitat. Thinning the additional 16 acres proposed for regeneration harvest under the Proposed Action would exhibit no detectable change in habitat features from the adjacent stands also being thinned, therefore there are no different effects associated with the Alternative Action in the Outer Limits area.

Proportional Thinning in the Fawn Two area

In the Fawn Two area, both stands 25A and 25B would have a prescription described as a "proportional thinning" under this Alternative Action. The proportional thinning prescription would leave clumps, gaps, and a variability of size classes within the stands after treatment. Immediately after timber harvest and site preparation the stands would appear open, with an average of 45 trees per acre. However, this thinning prescription would not leave a uniform distribution of trees and tree spacing and size would vary throughout the stands. Under the Alternative Action, 10-15 acres of the harvest units would contain unthinned "clumps" and each clump would be approximately 1 acre in size and retain all trees and vegetation within these clumps.

The area would have a remaining average RD of 25. These areas would increase understory layering, structural diversity and ground cover, adding complexity at both the forest stand and landscape levels. Species expected to benefit from low density thinning areas are ruffed grouse, Wilson's warbler, warbling vireo, song sparrow and big game species.

Throughout the project area the 45 trees per acre would be retained not only for green trees but for recruitment of snags and down logs in the future stands (*RMP p. 25*). As a result of thinning, growth of residual live trees would accelerate, so that larger trees would be available sooner for recruitment as snags and down logs than without thinning.

Snags, Down Logs (CWD), Remnants and Special Habitats

Existing large diameter down logs in more advanced decay conditions would persist and contribute to forest floor wildlife habitat conditions for many decades before passing through decay class five to become unrecognizable as down logs. It is anticipated that less than ten percent of existing down CWD would be directly impacted by logging. Less than ten percent of the thinning area would be directly impacted by skidding/yarding, which is the operation with the highest potential impact to existing CWD. BLM oversight of skyline corridor and skid trail locations would avoid impact to high value CWD wherever feasible.

There would be an effect to large remnants trees in Unit 25. The larger trees would be retained with the PDF to emphasize leaving trees over 36 inch DBH. Some trees marked for retention may need to be felled as a result of logging systems and this material would be left on site to contribute to down CWD. In the short term some trees may have lower branches broken and some wind throw due to opening the stand. The large trees that are left after harvest could produce epicormic branching in the long term, which would benefit red tree vole and other late serial associated species by creating nesting platforms.

As a result of increased growth rates of retained trees and snag/CWD creation, the RMP guidelines for snags (40 percent maximum population densities) and down logs (240 plus linear feet per acre of material in decay classes 1 or 2, at least 20 inches in diameter at the large end, and 20 feet in length) in the Matrix could be met in one to three decades.

Special Status Species, Survey and Manage Species, and Species of Management Concern

Refer to Table 24 for a summary of the Outer Limits/Fawn Two Alternative Action and its effects on spotted owl habitat.

Northern Spotted Owl – Federally Listed Species

The Fawn Two area Alternative Action may affect, and is likely to adversely affect, the spotted owl due to down grading of suitable habitat as a result of thinning. The proposal is to thin 63 acres of suitable habitat in the Little North Santiam 5th field watershed. The units are not located in 2012 Critical Habitat or unmapped LSRs, which are 100 acre core areas for known spotted owl sites as of January 1994.

The Fawn Two Alternative Action is consistent with the Revised Northern Spotted Owl Recovery Plan (NSO 2011) and conforms with Recovery Actions 10 and 32. Recovery Action 10 recommends conserving existing known spotted owl sites with high value habitat (*NSO 2011 p. III-43*). No harvest would occur within the PHR radius (1.2 miles) of any known active spotted owl site. Recovery Action 32 recommends land managers maintain high quality suitable habitat. No Recovery Action 32 habitat would be altered, since the proposed units do not meet the stand level conditions characteristic of Recovery Action 32 Habitat (*NSO p. III-67*).

The short-term effect of thinning will be downgrading 64 acres of suitable habitat to dispersal habitat. Habitat "downgraded" refers to silvicultural activities that change spotted owl suitable habitat to dispersal habitat. Suitable habitat would be downgraded, but dispersal habitat would be maintained after treatment. "Maintain" habitat means thinning in which forest stand characteristics are altered but the components of spotted owl habitat are maintained such that spotted owl life history requirements are supported. For spotted owl dispersal habitat, a canopy cover of over 40 percent along with other habitat elements (e.g. including snags, down wood, tree-height class-diversity, and older hardwoods) will be maintained post treatment to adequately provide for spotted owl dispersal.

As the thinned stand grows, habitat conditions would improve. Canopy closures would increase and the downgraded stand could attain suitable habitat conditions again within 10 to 30 years. Subsequent treatments to create snags and down logs would help move these stands toward suitable habitat conditions.

Table 24. **Owl Habitat Modification by Treatment type, Land Use Allocation, Pre/Post Treatment Habitat Type, Habitat Modification Type, and Effect Determination: Alternative Action**

5th. Field Watershed	Area	Township -Range-Section#	Proposed Treatment[1]	Acres	Land Use Allocation	Pre/Post Treatment Habitat Type[2]	Habitat Modification[3]	Effect[4]
Little North Santiam	Fawn Two	8S-3E-25	Proportional Thinning	63	Matrix	Suitable/Dispersal	downgrade	LAA
North Santiam	Outer Limits	10S-4E-29	moderate thin	208	Matrix/ RR	Dispersal/Dispersal	Maintain	NLAA
North Santiam	Outer Limits	10S-4E-17	moderate thin	100	Matrix/RR	Suitable/Suitable	Maintain	NLAA
TOTAL				**371***				

*total includes 3 acres of ROW (see Table 4, 5)

Notes and definitions for Table 24 (*BA pp. 2-3, 4; BO pp. 9-10, 17-19*).

1 Treatment Type:

Moderate thinning in dispersal or suitable habitat can be for forest health, to improve the structural characteristics of a stand, or to provide commodity. Such treatments may be described as commercial thinning, density management, selective cut, partial cut, or mortality (standing) salvage. Such thinnings maintain a minimum of 40 percent average canopy cover. Light to moderate thinnings can have long-term benefits to spotted owls by encouraging late-successional characteristics to occur more rapidly.

2 Habitat Types:

Suitable habitat is conifer-dominated, 80 years old or older and multi-storied in structure, and has sufficient snags and downed wood to provide opportunities for owl nesting, roosting and foraging. The canopy cover generally exceeds 60 percent.

Dispersal habitat consists of conifer and mixed mature conifer-hardwood habitats with a canopy cover greater than or equal to 40 percent and conifer trees greater than or equal to 11 inches average diameter at breast height (DBH). Generally, spotted owls use dispersal habitat to move between blocks of suitable habitat, roost, forage and survive until they can establish a nest territory. Juvenile owls also use dispersal habitat to move from natal areas. Dispersal habitat lacks the optimal structural characteristics needed for nesting.

3 Habitat Modifications:

Maintain habitat means to alter forest stand characteristics but maintain the components of spotted owl habitat within the stand such that spotted owl life history requirements are supported (i.e. the functionality of the habitat used by spotted owls remains intact post treatment). For spotted owl dispersal-only habitat a canopy cover of >40 percent along with other habitat elements (e.g. including snags, down wood, tree-height class-diversity, and older hardwoods) will be maintained post treatment to adequately provide for spotted owl dispersal.

Downgrade: Refers to silvicultural activities that change spotted owl suitable habitat to dispersal habitat.

4 Effect: **NE**=No effect; **NLAA**=May affect, but not likely to adversely affect; **LAA**=May affect and likely to adversely affect.

Survey and Manage

Red Tree Vole

The Fawn Two area was surveyed for red tree voles which resulted in two active nests and one inactive nest being located. The active nests were buffered by one site potential tree and a habitat area at least 10 acres was created around active nest. The habitat is considered to be

suitable for red tree voles. In the short-term, undetected nests could be destroyed or disturbed during thinning. Thinning can temporarily inhibit dispersal and make habitat less suitable because of wider spacing between crowns (*Hayes et al. 1997*). After thinning, stand conditions would improve over time as canopies close and large trees develop epicormic branching.

Other Species of Concern

Migratory and Resident Birds

Unintentional take of nests, eggs, nestlings and nesting failure would be likely if harvest operations occur during active nesting periods. In the western Oregon Cascades there is temporal variability of breeding bird species and individuals of the same species in forested habitats. For example, some owls and woodpeckers begin breeding in February or March, while some flycatchers do not finish breeding until August. The majority of birds in the Pacific Northwest complete their breeding cycle within the April 15 to July 31 time period (*Altman, Hagar 2007*). This is the critical breeding period for >90% of individuals and >90% of the bird species, and the greatest amount of take would occur if habitat modification occurs during these times (*Altman, Hagar 2007*). Since Fawn Two is located at lower elevations, the window for the seasonal restriction has been adjusted to April 1 to July 15.

With the recommended seasonal restriction from April 1 to July 15, the effects to breeding migratory and resident birds would be greatly reduced. The effects of thinning would be short term and would not reduce the persistence of any bird species in the watershed or populations at the regional scale.

Some individual birds may be displaced during harvest operations in the project area due to disturbance. Adjacent untreated areas and areas where active operations are not occurring would provide refuge, which would minimize short-term disturbance.

Changes in habitat structure would have immediate effects on bird communities in thinned stands. Thinning would immediately enhance habitat suitability for species which prefer a less dense conifer canopy, and reduce habitat suitability for species that prefer more continuous conifer canopies. Reducing the canopy closure and opening up stands is expected to have short term negative effects on the brown creeper, golden-crowned kinglet, hermit warbler, Pacific-slope flycatcher and varied thrush. Thinning would have positive long-term effects on this same set of species as understories develop and habitat quality improves.

Overall bird species richness (a combination of species diversity and abundance) would gradually increase as hardwood components develop, plant species composition becomes more complex, and hardwood shrub layers, epiphyte cover, and snag density become more prominent within the stands. The future development of hardwood/deciduous tree/bush components and canopy layers would favor species such as the band-tailed pigeon, ruffed grouse, red-breasted sapsucker, Wilson's warbler, Hutton's Vireo and black-throated gray warbler. The low density thinning patches would encourage the development of hardwood/deciduous tree/shrub components and canopy layers more rapidly and would further benefit this same set of species.

Bats

Under the Alternative Action, adverse impacts to bat species would be low. Old-growth forests provide higher quality roost sites than younger forests, and many species prefer older forests (*Thomas and West 1991, Perkins and Cross 1988*). There are few snags within the units proposed for thinning (*see EA Table 2*). Bat activity appears to be higher in thinned versus

unthinned stands. Structural changes in stands caused by thinning may benefit bats by creating habitat structure in young stands that bats are able to use more effectively (*Humes, Hayes, Collopy 1999*). Bat species are also associated with buildings, bridges, mines, cliff crevices and caves. None of these features are present in the project area.

Big Game

Under the Alternative Action, big game species would be temporarily disturbed during the implementation of the proposed thinning. Logging equipment noise and human presence may cause animals to avoid or disperse from the project area during times of operation. Thermal and hiding cover quality would decrease in the short-term as a result of thinning, opening new roads, renovating roads and road improvements (*Cole et al. 1997, Trombulak and Frissell 1999*). Saplings and vegetative forage such as shrubs, grasses and forbs would increase because of thinning and road closures after thinning. As a result of increased light, forage quantity would increase and attract early successional species such as elk and deer to the thinned areas. This response of early seral plant species would be especially evident in the low density thinning areas.

In the long term (five plus years), thermal and hiding cover quality would increase and vegetative forage would gradually decrease as a result of canopy closure, decreasing the amount of light reaching the forest floor. Vegetative forage would persist longer in low density thinning areas.

Cumulative Effects of Thinning in the Alternative Action

In the Outer Limits area

Thinning in all stands in the Outer Limits area would exhibit similar cumulative effects as the Proposed Action to wildlife and associated habitat. Thinning the additional 16 acres proposed for regeneration harvest under the Alternative Action would exhibit no detectable change in habitat features from the adjacent stands also being thinned, therefore there is no different, or additional, cumulative effect associated with this Alternative Action in the Outer Limits area.

In the Fawn Two area

The Fawn Two area, along with other planned projects in the foreseeable future, would retain over 44 percent of late-successional habitat on Federal lands in the Little North Santiam 5th field watershed after implementation (*NWFP p. C-44; RMP p. 25*).

The Little North Santiam 5th field watershed is 72,190 acres and the BLM manages about 13,255 (18 percent) of the watershed. The remaining 82 percent of the watershed is managed primarily by USFS (50 percent), Private (29 percent) and the State of Oregon (3 percent). The private lands are managed for forestry purposes according to the OFPA, and late successional habitat on non-federal lands are not expected to persist in the long term (20+ years). In the future, the average rotation ages when final harvest would occur would be less than the stand ages necessary to attain late-successional conditions. For these reasons, private lands would not contribute to late-successional conditions in the future. Currently, late successional forests comprise 69 percent of the Federal ownership in the watershed. The Fawn Two project Alternative Action proposes to treat 63 acres (<0.2 percent) of late successional forests on Federal lands.

The Fawn Two area is located in the Upper Little North Santiam 6th field watershed, which is 19,192 acres in size, and contains 5,616 acres (29 percent) of BLM lands. Currently, late successional forests comprise 52 percent of the BLM ownership in the watershed. The Fawn Two area proposes to thin about 2 percent of these late successional forests on BLM lands in the Upper Little North Santiam 6th field watershed.

At the local scale of the contiguous 2,645 acre BLM parcel in which the project would occur, 64 acres (7 percent) of the total 948 acres of late seral forest is proposed for thinning treatment.

Snags, Down Logs (CWD) and Remnants

Thinning these stands would reduce the number of small diameter (less than 15 inches DBH) snags over the next 10 to 30 years that would otherwise die from suppression mortality and become snags. Analysis shows that 97 percent of the mature stands in the Upper Little North Santiam 6th SWB would remain untreated. Smaller scale analysis shows that on BLM land in the immediate vicinity of the treated areas, 93 percent of these stands would remain untreated. Small dead wood would still be present and available in adjacent untreated areas. PDFs would be put in place to retain existing down logs 20+ inches and snags 15+ inches diameter. Any snag that falls for any reason as a result of thinning operations would remain on-site to become down CWD, providing important habitat for a different, but also key group of dead-wood associated species (*Aubry 2000, Bowman et al. 2000, Butts and McComb 2000*).

Up to two trees per acre would become snags or down logs through logging where leave tree damage occurs and reserve trees are felled and left to facilitate logging.

Beneficial long term cumulative effects to larger CWD and associated wildlife species would occur as a result of implementing the project, since larger trees would be available sooner than without thinning to contribute additional large snags and CWD recruitment in future stands. As larger trees develop in the residual stands, they would provide source material for girdling and topping.

Special Status Species, Survey and Manage Species, and Species of Management Concern

Northern Spotted Owl – Federally Listed Species

The scale for cumulative effects for the spotted owl is the home range of known spotted owl sites (*BA, pp. 3-4; BO, pp. 17-18*) and the location of the project in relationship to adjacent known spotted owl sites and LSRs. The scale was chosen because the NWFP for conservation and recovery for spotted owls prescribes maintaining suitable owl habitat within LSRs and the PHR of known owl sites and dispersal habitat between LSRs and known owl sites. The Alternative Action would maintain dispersal habitat within and between known owl sites, and no harvest would occur in LSRs, Recovery Action 10 or Recovery Action 32 habitat.

In the Fawn Two area

No harvest would occur within the PHR of any known spotted owl sites and dispersal habitat would be maintained between known spotted owl sites and LSRs. Therefore, the Alternative Action would not contribute to cumulative effects to spotted owls.

In the Outer Limits area

Harvest would occur within the provincial home range of a known spotted owl sites and suitable and dispersal habitat would be maintained in these known spotted owl sites. Therefore, the Alternative Action would not contribute to cumulative effects to spotted owls.

Special Status Species, Survey and Manage Species

The Alternative Action would not contribute to cumulative effects to any Special Status or Survey and Manage species. No BLM Sensitive species have been found during surveys of the area. Survey and Manage species have been found. The red tree vole is a Survey and Manage species, the active sites were given a 10 acre buffer to maintain an active site. By not treating 97 percent of the mature stands in the Upper Little North Santiam 6th SWB, there would be enough suitable habitat to maintain a viable population in the SWB. A high percentage of similar habitat in the watershed would remain untreated and high quality suitable habitat for Special Status/Survey and Manage species would remain intact. Implementation of the project would not eliminate connectivity between adjacent untreated stands under BLM management.

Migratory and Resident Birds

No cumulative effects to birds are expected. The Alternative Action would not reduce the persistence of any bird species in the watershed or populations at the regional scale. Habitat changes resulting from the Alternative Action would not change seral stage habitat or change any patch size, and therefore would not contribute to fragmentation of bird habitat. Thinning would not contribute to a fundamental change in the species composition of existing bird communities within the watershed. In the long term, the thinning could have the potential to improve habitat for bird species as this stand continues to mature, resulting in greater bird species diversity.

Bats

Cumulative effects to bats would be low and follow closely the cumulative effects to snag and late successional habitat. Habitat quality for bats is poor due to the lack of suitable snags and other primary habitat features for bats.

Big Game

No adverse cumulative effects to big game species populations are expected. The Alternative Action would not change any forest cover type or change any habitat patch size. Therefore, thermal and hiding cover present before treatment would be maintained after harvest. Variable density thinning, including low density thinning areas, is expected to improve the quality of forage and cover both in the short and long term.

In conclusion, thinning in the project areas would not be expected to contribute to the need to list any Bureau Sensitive species or species of concern under the ESA (BLM 6840). Habitat for the species that are known to occur in the watershed would be maintained, habitat connectivity would not be changed, any habitat alteration would have only short-term negative effects, and long-term effects could be beneficial.

No Action Alternative

Late successional habitat

Late successional habitat conditions would continue to develop slowly. In the Outer Limits area, these stands would remain low in species and vertical diversity for 20-40 years. In the Fawn Two area the stands would continue to have shade tolerant tree species seed in and develop. These trees would slowly add vertical diversity, and understory layering.

Snags and Coarse Woody Debris

Self-thinning would occur slowly. In the Outer Limits area snags and down logs created by suppression mortality would not be large enough to meet RMP standards until later in the life of the stand (approximately 20-60 years) when suppressed co-dominants achieve these diameters before dying. In Fawn Two, the trees are larger, and snags and down logs from suppression mortality would be large enough to meet RMP standards.

No snag or CWD creation in either area would occur, and CWD development would occur over a longer period through self-thinning. Understory and ground cover development would establish more slowly as self-thinning occurs, or until a disturbance such as fire or wind removes over story trees, allowing light to reach the forest floor.

Special Status Species, Survey and Manage Species, and Species of Management Concern

Northern Spotted Owl – Federally Listed Species

There would be no immediate change in spotted owl habitat and no effect to spotted owls if no timber harvest were to occur. Habitat conditions would remain as described in the Affected Environment and would develop slowly for the reasons stated above. Currently, the stands in the Outer Limits area are marginally suitable and currently dispersal habitat. In the Fawn Two area, the stands are suitable habitat and would not be downgraded or removed. Habitat in both areas would slowly improve under the No Action Alternative.

Special Status Species, Survey and Manage Species

In the short term, there would be no immediate change in current habitat conditions for Survey and Manage and BLM Special Status species. In the long term trees would grow slowly, and material available for CWD recruitment would average smaller in diameter than if thinning were occur. Since no new disturbance to the conifer canopy would occur, no undetected red tree vole nests would be affected. Optimal habitat for the red tree vole would develop more slowly without thinning. Habitat would remain the same for Bureau Sensitive mollusk species in Section 17.

Migratory and Resident Birds

Habitat conditions would remain as described in the Affected Environment and would continue to develop slowly. In Section 29 of Outer Limits and the entire Fawn Two area, species richness of bird communities would reflect mid to early mature for a longer period of time and overall bird species richness would be less than if stands were thinned. Bird species richness may not noticeably increase, and legacy features in the future stand would likely be smaller and less persistent, especially those that provide habitat for cavity-nesting species. Habitat would remain the same for migratory and resident birds in Section 17.

Bats

Habitat conditions would remain as described in the Affected Environment and would continue to develop more slowly. Stand mortality would allow for some large snags in the Fawn Two area.

Big Game

In the short term, there would be no disturbance effects since the Proposed Action will not be implemented. Thermal and hiding cover quality would remain the same as current conditions. There would be no increase in the vegetative forage due to increased light to the forest floor. In the long term, thermal and hiding cover quality would remain about the same as the stands grow. Forage quality would decrease as less light reaches the forest floor.

3.3.6 Air Quality and Fire Hazard/Risk

Sources: *Outer Limits/Fawn Two Fuels Specialist Report, Mortensen et. al 2015. Outer Limits/Fawn Two Silvicultural Prescription, Bonney et al 2015.*

Methodology:

- The Cascades RA Fuels Management Specialist assessed air quality and fire hazard and risk by using the following methodologies:
- For CWD information, Stand Exams were conducted in 2012. Additional stand information was gathered in 2013 by BLM specialists.
- Fire Regime and Condition Class descriptions to determine fire frequency and vegetation characteristics are available at: (http://www.nwcg.gov/teams/wfewt/archive/message/FrccDefinitions.pdf)
- The modeling predictions for fire regime and condition class come from the LANDFIRE Rapid Assessment Vegetation Models and is available at. (http://www.fs.fed.us/database/feis/fire_regime_table/fire_regime_table.html)BLM
- Wildfire frequency information was gathered from the ODF website and is available at: (http://oregon.gov/ODF/FIRE/HLCause.pdf).
- Fuel models were determined by using the Aids to Determining Fuel Models For Estimating Fire Behavior General Technical Report INT-122: National Wildfire Coordinating Group, U.S. Department of Agriculture, U.S. Department of the Interior, National Association of State Foresters, National Interagency Fire Center, BLM Warehouse, Boise, Idaho (*Anderson 1982*)
- Current and potential logging slash residues were determined by conducting a visual "walk through" and by consulting the Stereo Photo Series for Quantifying Forest Residues in Coastal Oregon Forests: Second-Growth Douglas-Fir---Western Hemlock Type, Western Hemlock---Sitka Spruce Type, and Red Alder Type, General Technical Report PNW-GTR-23, U.S. Department of Agriculture - Forest Service, Pacific Northwest Research Station, Siuslaw National Forest (*Ottmar, Hardy 1989*), and the Stereo Photo Series for Quantifying Forest Residues in Douglas-fir hemlock Type of the Willamette National Forest, General Technical Report PNW-GTR-258, U.S. Department of Agriculture - Forest Service, Pacific Northwest Research Station, Siuslaw National Forest. (*Ottmar, Hardy, Vihnanek 1989*).

3.3.6.1 Affected Environment

Air Quality

The major source of air pollutants within the Outer Limits/Fawn Two area is smoke associated with resource management activities, including prescribed burning (broadcast, hand, machine, and landing piles), fossil fuel combustion and dust from the use of natural-surfaced roads.

The State of Oregon has designated the Willamette Valley as a Smoke Sensitive Receptor Area (SSRA). The Willamette Valley experiences periods of air stagnation where cold air often becomes trapped near the valley floor with slightly warmer air aloft, creating conditions known as temperature inversions. These conditions result in trapping and concentrating air pollutants near the ground. Wintertime temperature inversions contribute to high particulate levels, often due to wood burning for home heating and fossil fuel combustion. Stagnant periods contribute to increases in ozone levels, causing the local air quality to deteriorate.

Fire Hazard/Risk

The climate in Northwest Oregon is considered mild and wet in late Fall, Winter and early Spring. In the Oregon Cascade Mountains, snowfall accumulation remains at higher elevations (~2,500^{+} feet) for an extended period of time, but does not persist for long periods at lower elevations. Summers are warm with periods of dry weather during the months of July, August, and September. Summer mean temperatures during this period average approximately 55°- 60°F for lows and highs of 75° - 80° F. Extreme high temperatures reaching into the mid to upper 90's, and occasionally topping 100° F are common, but infrequent and occur for short durations. During average weather years, the conditions under the forest canopy remain relatively moist.

Fire is a natural disturbance process in the analysis area, especially on the southern slopes located within the North Santiam and Little North Santiam River 5th field watersheds. Fire effects are influenced by habitat type, fire frequency, fire duration, and fire intensity (*Van Wagner 1965*). These effects vary with forest type, depending on fuel type, structure, topography, and weather. Fire can influence; vegetation composition, age, and structure, successional pathways; nutrient cycling; fish and wildlife habitat and insect and disease vulnerability.

Wildfires within the project areas have been primarily human-caused. Wildfire risk from humans within the project area is higher than compared to lightning. Dry lightning (lightning that that has no accompanying moisture) is uncommon in Northwest Oregon. The project area is located within the ODF's Northwest Oregon Area - North Cascades District - Santiam Unit. Over the last ten years an average of four fires per year are attributed to lightning while twenty fires per year are human caused. The average size of lightning fires is approximately three quarters of an acre while the average size of human caused fires is approximately forty acres in size (*ODF 2014*).

The overstocked stands in the project area could sustain a high intensity crown fire because of the amount of potential ladder fuels and the available fuel density in the canopy (canopy bulk density). RD above 35-45 percent is associated with a canopy bulk density which could sustain a high intensity crown fire (*Agee 1996*). The average RD of the forest stands within the project area is approximately 69 percent (*see EA Section 3.3.1, Vegetation*).

Fire Regime and Condition Class (FRCC)

The Outer Limits/Fawn Two area occurs within the Pacific Northwest Forested landscape and potential natural vegetation groups in the area are Douglas-fir-western hemlock dry mesic and Douglas-fir-western hemlock wet mesic. The Fire Regime classifies the role fire would play across the landscape in the absence of recent human intervention. The area falls within two different Fire Regimes:

- Fire Regime III is characterized by a moderate to low fire return interval with a mixed severity and is associated with south and west facing slopes. More than 75 percent of fires are characterized as mixed or low severity.
- Fire Regime V is characterized by a low fire return interval with a high severity and is associated with north facing slopes. More than 70 percent of fires are characterized as stand replacement.

The Condition Class classifies the degree of departure from the natural fire regime. The timber stands in the analysis area generally fall within Condition Class 2 or 3. Forest management on both BLM and Private lands in the Outer Limits/Fawn Two area has altered the natural forest composition and structure and created large tracts of even-aged, overstocked stands, young plantations and clearcuts.

- Condition Class 2 indicates that fire regimes have been moderately altered from their historical range.
- Condition Class 3 indicates that fire regimes have been substantially[43] altered from their historical range.

Timber Stand and Fire History

Fire does play a major role as a natural disturbance agent, as do people. The pre-settlement fire history of the Outer Limits/Fawn Two area is not well documented. Although it is known that Native Americans burned within the Willamette Valley, to what extent this burning extended into the Cascade foothills and up the river corridors is not specifically known. Post-settlement fire history in the project areas does not document any wildfire occurrence. However in Section 29 of the Outer Limits area the 1955 aerial photo shows an irregular disturbance pattern. In 1961 there was a contract to fell snags within the BLM managed portion of Section 29 and the map of the project area shows a "green timber" edge adjacent to the project area. A total of 2,588 snags with an average diameter at breast height of 28 inches were identified for felling. Snag falling contracts were often implemented following wildfires to reduce the chance of fire spreading from snag to snag. Snag felling was also a standard practice in timber sales when fire salvage was completed. There are no current records that show anything in the project areas was harvested.

In late August, 2006, lightning storms tracked a line from the south and ran north up the divide between Quartzville Creek and the Middle Santiam. The storm started 17 fires all of which were contained quickly except for two blazes. The Boulder Creek and Rocky Top # 5 fires grew in

[43] The original description for condition class 3 uses "significantly", which has a specific meaning in NEPA that is not intended in the context of the model.

size and complexity in old growth timber on steep inaccessible terrain. On BLM land the Boulder Creek Fire burned 63 acres and the Rocky Top # 5 fire burned 28 acres. Later the same year, in September, 2006, the Middle Fork Fire burned approximately 1,170 acres of which approximately 280 acres were located on BLM land. These fires were within ten to fifteen miles of the Outer Limits/Fawn Two area.

Past forest management has shaped the analysis area. Areas outside of the proposed harvest units were previously clearcut harvested between the 1950's and 1990's. Many areas adjacent to the analysis area on private and the State or Oregon timber land have also been harvested during this time to the present. Harvest areas on BLM land during this period often had been broadcast burned or had spot burning associated with them. Burning primarily occurred for site preparation prior to tree planting but also to reduce the fuel load and limit the potential of a future wildfire.

The average fire return interval has increased following the advent of fire suppression in 1910. It has been decades since the most recent man-caused disturbance (logging) occurred within the project areas. Although fire has been excluded from the landscape by aggressive fire suppression, the project areas are still within the range of a normal fire return.

3.3.6.2 Environmental Effects

Proposed Action

Air Quality

An increase in vehicle traffic would occur over access roads during the implementation of this project. The increases would be considered short-term while the project is implemented. Fossil fuel combustion and dust created from vehicle traffic from Proposed Action activities on gravel or natural-surface roads would contribute short-term (during project work) effects to air quality. These effects would be localized to the immediate vicinity of the operations.

The overall effects of smoke on air quality is predicted to be local and of short duration. Activities associated with the Proposed Action would comply with the provisions of the Clean Air Act. All prescribed fire burning would be done in accordance with the Oregon State Implementation Plan and Oregon Smoke Management Plan. The potential for smoke from prescribed fire to intrude into SSRA is low. Burning is usually completed when the prevailing winds are blowing away from the SSRA and under atmospheric conditions that favor good vertical mixing so that smoke and particulate matter is dispersed by upper level atmospheric winds.

Approximately 102 acres could be treated with prescribed fire, removing and burning approximately 43 tons of slash per acre, or 3,397 total tons.

Prescribed burning would cause short-term impacts to air quality that would persist for one to three days within one-quarter to one mile of the project units. None of the proposed treatment units are close enough to public highways to affect motorist safety.

Fire Hazard and Risk

The modeling predictions for fire behavior (*Anderson, April 1982*) are based on the National Fire Danger Rating System (NFDRS) fuel models. Regeneration stands would move from a Fuel Model 8 (closed timber litter) to Fuel Model 12 (medium logging slash) immediately following harvest. Commercially thinned stands would move from a Fuel Model 8 (closed timber litter) to a Fuel Model 11 (light logging slash) immediately following harvest. The fuel load and risk of a

fire start would increase and would be greatest during the first year following treatment when needles are dry and remain attached to tree limbs. The ability to control a fire would decrease during this period as a result of the proposed action.

Thinning trees would decrease both the amount of potential ladder fuels and the canopy bulk density in the project areas because the silvicultural prescription would lower the RD to approximately 32 percent. A RD of 35-45 percent or lower has been identified as the point where canopy bulk density is unlikely to sustain a high intensity crown fire (*Agee 1996*). The silvicultural prescription for all of the units in the project areas falls within or below this range.

Following treatment containment of wildfires at less than 10 acres in size should continue to be attainable and the ability to successfully control wildfires in the fuels treatment areas would remain high. For the short-term (0-5 years), the fire risk would increase in all of the thinned areas, however due to decreased crown density and reduction in ladder fuels fires would be expected to remain as ground fires which can be successfully controlled. Decreasing fuel loading in strategic locations, such as along roads and property lines, would reduce the potential for human caused fire starts and would provide fuel breaks with lower fire intensity, rates of spread and flame lengths where fire can be successfully controlled by initial attack resources. The ODF has responsibility for fire protection on BLM lands in western Oregon.

Cumulative Effects

There would be no cumulative effects to air resources, as the direct and indirect effects from the projects would be local and of short duration. No other effects in the project areas affecting this resource are anticipated. Based on past experience with broadcast burning, and pile burning within this habitat type and adherence to smoke management plans, there are no expected cumulative effects on air quality from the planned fuels treatment under this proposal.

There would be an increase in fuel loading and resultant fire hazard in the short-term (0-5 years). In the commercial thinning area, density management area, regeneration harvest area, along roads and property lines, and in gaps, the hazard and risk of fire would be minimized by the use of fuels reduction treatments. The localized increase in fire risk would diminish over time as slash decomposes. There would be positive benefits to the thinned stands in the longer term due to the wider spacing between tree crowns and the removal of most of the ladder fuels that are conducive to the spread of fire into the tree canopy. At a watershed scale, the commercial thinning, density management, and regeneration treatment of approximately 368 acres of forest habitat would have very little effect on fire intensity or starts. However, due to reduced canopy density and ladder fuels, the potential for the stand to carry a crown fire would be reduced in the long term (>5 years).

Alternative Action

The air quality and fire hazard/risk effects and cumulative effects of 368 acres of commercial and proportional thinning and fuel reduction within those units would be less than those described in the Proposed Action because broadcast burning would not be a potential treatment within the thinning units.

Approximately 23 acres could be treated with prescribed fire in commercial thinning units. This would remove approximately 41 tons of slash per acre or approximately 861 total tons from the highest risk areas within the project.

Commercial thinning stands would move from a Fuel Model 8 (closed timber litter) to Fuel Model 11 (light logging slash) immediately after logging. Ignition potential would increase in the short-term (0-5 year) because of the increase in fine dead fuels and then would slowly drop to for many years until growing vegetation creates a new fuel load.

There would be no cumulative effects from the Alternative Action to air resources from landing, machine, and handpile burning because the direct and indirect effects would be local and of short duration. There would be no cumulative effects to fire hazard and risk because the reduced potential for ignition and wildfire after burning on 23 acres would have no discernable effect on fire intensity or starts at a watershed scale.

No Action Alternative

Air Quality

Effects of vehicle exhaust and dust from vehicle traffic on gravel and natural-surface roads in the Outer Limits/Fawn Two area would continue at approximately the current levels since current traffic patterns would likely continue. These effects would be minor and localized to the immediate vicinity.

No regeneration harvest, commercial thinning, density management, road construction or road renovation, log hauling, or prescribed burning would occur so there would be no additional localized effects to air quality from management operations.

High stocking density would cause these forest stands to become more susceptible to a stand replacement fire event due to fuel loading and ladder fuels. In the event of a wildfire, poor air quality would be expected due to the high volume of smoke produced, potentially for several days to weeks.

Fire Risk

Vegetation growth in the project areas would continue on its current trajectory. The current risk of a fire start would remain low. There would be a slow increase in the coarse woody fuel load (1000 hour fuel class) and in the smaller size fuel classes, (1, 10, and 100 hour fuels) in these timber stands as mortality within the stands increases. Ladder fuel densities would increase as additional trees become suppressed and die in the understory, shade tolerant species become established, and dominant trees increase in size. The potential for these stands to eventually succumb to a wildfire would continue to increase as they near the maximum fire return interval and the Condition Class departs further from the natural fire regime.

3.3.7 Carbon Storage and Carbon Emissions

Sources: *Outer Limits/Fawn Two Carbon Analysis Report, Ruzicka, 2016. Outer Limits/Fawn Two Silvicultural Prescription, Bonney 2015.*

Resource Specific Methodology

The BLM calculated estimates of existing carbon stores, the amount of carbon to be removed by the Proposed Action and Alternative Action, storage of removed carbon, and of future carbon storage in the remaining and regenerated trees in the stand. The estimates are based on data from BLM stand exams modeled with the ORGANON (*Hann et. al. 2006*) program, analysis of carbon storage in the FEIS for the Revision of the Resource Management Plans of the Western

Oregon Bureau of Land Management (*WOPR Ch. 3 p.220-224 and Ch. 3, p.537-543, Appendix C, p. 30, and literature review).*

On July 16, 2009, the U.S. Department of the Interior withdrew the Record of Decision (*2008 ROD*) for the Western Oregon Plan Revision. The information contained in the Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management (*2008 FEIS*) is relevant since it examined recent and applicable science regarding climate change and carbon storage. That analysis concluded that effects of forest management on carbon storage could be analyzed by quantifying the change in carbon storage in live trees, storage in forests other than live trees, and storage in harvested wood. The discussion on Volume I, Pages 220-224; Volume II, Pages 537-543, and Volume III, Appendices, Pages 28-30 are relevant to the effects analysis for this project and are incorporated by reference.

Context

Greenhouse Gases, Climate Change and the Spatial Scale for Analysis

Uncertainty about the nature, effects and magnitude of the greenhouse gases and global climate change interrelationship is evident in a wide range of conclusions and recommendations in the literature reviewed. However, Forster et. al. 2007 (*pp. 129-234*), which is incorporated here by reference, concluded that human-caused increases in greenhouse gases are extremely likely to have exerted a substantial effect on global climate. Additionally, the Intergovernmental Panel on Climate Change (IPCC) fifth assessment report has concluded that climate change has already caused impacts on both natural and human systems (*IPCC 2014*).

The assumption of climate stability is inherent in the carbon calculator used by the BLM in this analysis. However, climate change is likely to substantially alter future growing conditions for forests in the Pacific Northwest. Temperatures are expected to increase, especially in the spring and summer, while predicted changes to seasonal precipitation vary, but are generally expected to slightly decrease in the summer and slightly increase in the winter (*Chmura et al. 2011 and references therein*). Also, increased atmospheric CO2 may increase tree growth through increased water use efficiency but this will depend on the local factors limiting tree growth (*Penuelas et al. 2011*). Changing climate will also alter disturbance regimes, likely increasing the potential for fire and insect outbreaks (*Chmura et al. 2011*) or have a synergistic effect between them (*Raffa et al 2008*). The effects of these changes have a variety of consequences for modeling carbon storage in the Pacific Northwest (*Law and Waring 2015*).

However, the assumption of stability is valid for this analysis by the BLM as climate change will likely affect all alternatives in a similar fashion. It may even underestimate the carbon storage under the action alternatives because in general less dense forests are thought to be more resistant to water limitations and stand-replacing fire (*Chmura et al. 2011*). For this analysis, the BLM assumes that while the absolute values for carbon storage would likely change under the effects of climate change on forest growth, the relative values for comparing alternatives will not.

The U.S. Geological Survey, in a May 14, 2008 memorandum to the USFWS, summarized the latest science on greenhouse gases and concluded that it is currently beyond the scope of existing science to identify a specific source of greenhouse gas emissions or sequestration and designate it as the cause of specific climate impacts at a specific location. This defines the spatial scale for

analysis as global, not local, regional or continental. That memorandum is incorporated here by reference. Additionally, the BLM Instruction Memorandum OR-2010-012, issued January 13, 2010 and incorporated by reference, states that the incremental effects of project actions should be addressed in the context of cumulative effects at multiple spatial scales.

Based on the BLM's review of statutes, regulations, policy, plans and literature, the BLM presents the conclusions above as appropriate context for a reasoned choice among alternatives.

Temporal Scale for Analysis

The BLM has selected seventy years as the time frame for analysis of carbon storage and climate change for this project. Seventy years is minimum rotation length of the stand in the project as rotation length of 70-110 years is directed (*RMP, p. D-1*). Seventy years also provides a clear difference in the magnitude between the full cycle of carbon storage and release for this project and would likely be similar for future rotations. Additionally, due to the age of many stands in the project, uncertainty within the ORGANON model increases for stand simulations past 120 years of age. Using seventy years of analysis minimizes model uncertainty for some stands.

Calculations of Carbon Storage, Project Area Scale

The BLM used site specific data from stand exams as input to the ORGANON model to calculate carbon flow on the project area and the direct effects of the Proposed Action and alternative actions. Volume changes were used with calculations from Smith et. al, 2006 and DOE, 2007 cited in WOPR Appendix C to obtain carbon figures. Greenhouse gas emission from harvest operations were calculated based on equipment production rates from appraisal estimates for the Salem District BLM and Outer Limits\Fawn Two timber sale. The purpose of the calculations is to provide a basis for determining the significance of carbon storage relative to the temporal and spatial scale

3.3.7.1 Affected Environment

The Proposed Action is to commercially thin approximately 289 acres of 76-101 year old forest stands and regeneration harvest 79 acres of 93 and 134 year old forest stands. The Alternative Action proposes to thin the 368 acres of 76-134 year old forest stands. Carbon storage analysis pertains only to the regeneration harvest and commercial thinning in each alternative because the treatment areas represent nearly all the changes in carbon storage for the project.

Under average historic conditions (*WOPR, p. 3-211*), BLM-managed lands in western Oregon stored 576 million tonnes of carbon, 35 percent more than is currently stored in forests and harvested wood in these forests today. This is due to the greater proportion of younger stand structural stages in BLM-managed lands in western Oregon today (*WOPR, p. 3-224*).

The following show quantities of carbon in forest ecosystem vegetation[44] worldwide, in the United States, and in the Outer Limits\ Fawn Two project area.

[44] Carbon contained in both above ground and below ground parts of trees and forest vegetation, and downed wood, litter and duff. It does not include mineral carbon in soil, nor fossil fuels.

- Total carbon, forest ecosystem vegetation, Worldwide = 132-457 Gt[45] (*Matthews et al. 2000, p. 58*).
- Total carbon, forest ecosystem vegetation, United States = 27 Gt (*USEPA 2009*).
- Total carbon, forest ecosystem vegetation, Pacific Northwest, Western Cascade Range 1.5-1.7 Gt (*Hudiburg et al. 2009*).
- Total current carbon, forest ecosystem vegetation, Outer limits\Fawn Two~ 63,000 tonnes or 0.000063 Gt. This represents .000001 percent of the United States total or .000061 percent of the Western Cascade Range total.
- The annual accumulation of carbon from forest management in the United States is 191 million tonnes. Implementation of current management on BLM-managed lands in western Oregon would result in an average annual accumulation of 16,900 tonnes over the next 100 years, or 0.9 percent of the current U.S. accumulation. (*WOPR, p. 4-537*).

3.3.7.2 Environmental Effects

Proposed and Alternative Actions

Total carbon in forest ecosystem vegetation can be divided into three pools: live trees (foliage, branches, stems, bark and live roots of trees), forest carbon other than live trees (dead wood and roots, non-tree vegetation, litter and soil organic matter) and harvested wood products. The major changes in carbon storage caused by the Proposed Action would be in the live tree pool, by moving carbon from the live tree pool to the other than live trees and harvested wood products pools. Modeling used by the BLM assumes that inputs (logging slash) and reductions (fuel treatments, breakage) to the "other than live trees" pool approximately balance each other, so only changes to live tree and harvested wood pools are calculated.

Other aspects of the “other than live tree pool” such as soil carbon flux and decomposition have the potential to be different among alternatives. Forest vegetation can increase carbon storage in soils through afforestation of agricultural lands, but harvest effects on soil carbon fluxes are generally non-significant (*McKinley et al. 2011*). Decomposition of organic matter is also assumed to be similar for all action alternatives. This assumption likely slightly increases the estimate of carbon stored in the No Action Alternative because the Proposed Action young stands are greater carbon sinks than older stands which can sometimes be slight carbon sources in western Oregon (*Law et al. 2004*). However, due to the age of the stands at the end of the modeling period, this difference is not expected to be significant enough to affect the alternatives comparison.

In summary, the Proposed and Alternative Action would cause short term direct effects on greenhouse gas levels by emitting greenhouse gases (specifically, carbon dioxide) from harvest operations and fuel treatment which are calculated in this report. At the end of the modeling period, all alternatives show an increase in carbon storage over current levels with relative amounts inverse to harvest intensity.

[45] A Giga-tonne (Gt) is one billion tonnes, or metric tons.

Live Trees

Live trees would be removed, moving carbon to the other two pools. Harvest and fuel treatment would reduce total forest ecosystem vegetation carbon in the project area from 62,620 tonnes to 32,924 tonnes in the Proposed Action and to 34,705 tonnes in the Alternative Action.

Forest Carbon Other Than Live Trees

Some carbon would be converted to forest carbon other than live trees, dead material that would store carbon and slowly release it through decay. Broadcast burning (79 acres) and pile burning after harvest will result in 716 tonnes of carbon dioxide in the Proposed Action. Fuel treatments in the Alternative Action would result in emissions of 245 tonnes.

Harvested wood

After harvest, some carbon in live trees is stored as harvested wood. The harvested saw log gross carbon for the Proposed Action equals 29,696 tonnes (1 Mbf = 1.3 tonnes carbon). Over the 70 year analysis period, approximately 4,798 tonnes would be emitted without energy capture. Approximately 9,617 tonnes of the carbon would remain stored in products still in use and in landfills, or emitted with energy capture (*based on regional averages, Smith, et al. 2006, WOPR, Appendix C:30).* In the Alternative Action, approximately 27,915 tonnes of harvested carbon would result in 4,540 tonnes of emission and 9,100 tonnes of storage.

Harvest Operations

The proposed harvest operations would emit greenhouse gases. In the Proposed Action, the equipment use necessary to harvest and transport the timber to the nearest mill (Mill City, Oregon) was estimated at approximately 1.94 gallons/ Mbf (*Salem District Fuel Use Appraisal for Carbon Calculations, on file at Salem District Office*). Carbon emissions from fuel consumption would result in total emissions of 112 tonnes of greenhouse gases in the Proposed Action. In the Alternative Action, carbon emissions from fuel consumption is estimated at 124 tonnes.

Greenhouse Gas Emissions

To summarize, total greenhouse gas emissions resulting from the harvest operations emissions, fuels treatment and harvested wood for each alternative would include the following:

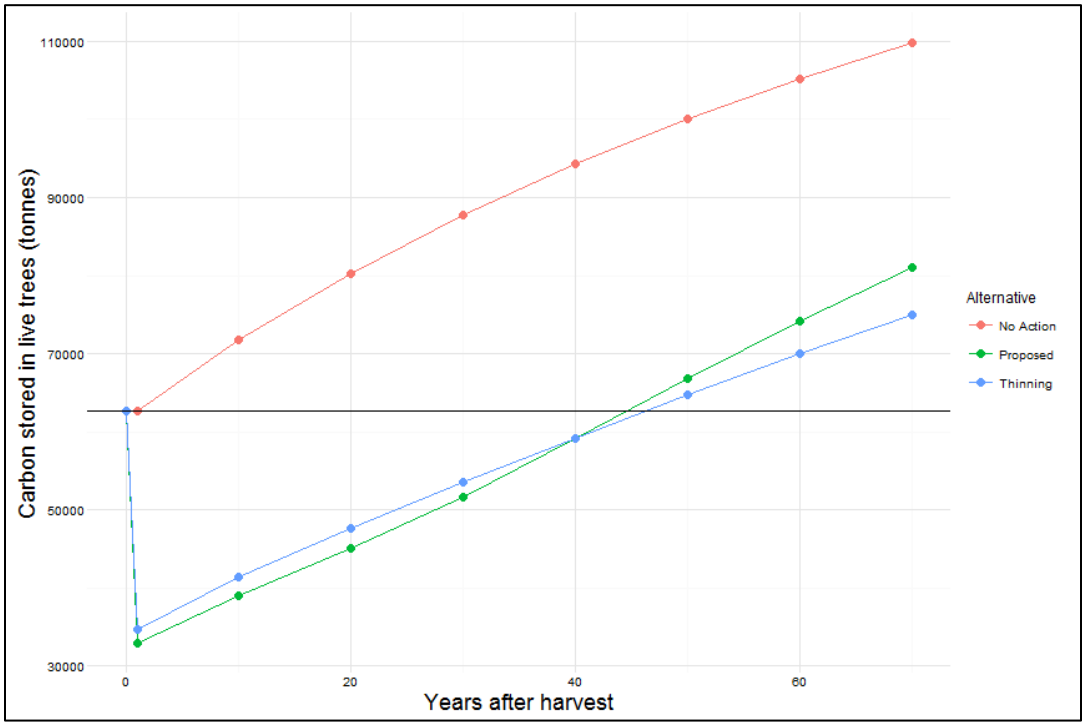
- Proposed Action: 5,627 tonnes
    - Harvest operations emissions totaling about 112 tonnes
    - Fuel treatment (burning) emissions totaling 716 tonnes
    - Emissions from harvested wood, over 70 years of 4,798 tonnes.
- Alternative Action: 4,909 tonnes
    - Harvest operations emissions totaling about 124 tonnes
    - Fuel treatment (burning) emissions totaling 245 tonnes
    - Emissions from harvested wood, over 70 years of 4,540 tonnes.

Future Carbon Storage

Following regeneration harvest in the Proposed Action, some of the largest trees would remain and seedlings would be planted. These trees would store carbon as they grow. Carbon emissions resulting from the Proposed Action (4,798 tonnes) would be offset by the carbon storage in tree

growth for approximately10 years after harvest. The live tree carbon level would equal the pre-treatment level after approximately 45 years of growth (*see Figure 16*).

Figure 16: Live tree carbon storage over the 70 year analysis period in the Outer Limits/Fawn Two project



After 70 years of growth, carbon stored in live trees would be 81,102 tonnes which is an increase of 18,482 tonnes from the current (pre-harvest) level of 62,620 tonnes. In addition, 9,617 tons would remain stored in harvested wood. The total carbon storage is calculated at 28,099 tonnes over the 70 year analysis.

Greenhouse gas emissions and carbon storage over the 70 year analysis period resulting from all alternatives are displayed in Table 25.

Cumulative Effects

Proposed and Alternative Actions

Greenhouse gases resulting from the Proposed Action and Alternative Action would total 4,909 to 5,627 tonnes of carbon dioxide. Current global emissions (2010) of carbon dioxide total 49 Gigatonnes of CO2-equivelent (*IPCC 2014*), and current U.S. emissions of carbon dioxide total 6.7 billion tonnes (*EPA 2014*). Therefore, the emissions from the proposed action would constitute at most .0000002 percent of current global emissions and .0000008 percent of current U.S. emissions. This is less than the daily emissions in 2013 (6,871 tonnes) from vehicle use in Portland, Oregon (*data acquired from the City of Portland Bureau of Planning and Sustainability, available on file, BLM Salem District Office*).

Tree growth following harvest would offset greenhouse gases and result in net storage of 12,303 to 18,482 tonnes of carbon. This would contribute an annual average of 34 to 52 tonnes to the U.S. annual accumulation of carbon from forest management of 191 million tonnes. The 2008 FEIS (*p. 4-538*), states that by 2106, the No Action Alternative (management under the 1995 RMP) would result in a total carbon storage of approximately 628 million tonnes for all western Oregon BLM-administered lands, 9 percent higher than average historic conditions (576 million tonnes, *WOPR, p. 3-224*). The incremental effect of both the Proposed Action and the Alternative Action, over time, would be net storage of carbon.

No Action Alternative

Under the No Action Alternative, no greenhouse gases would be emitted from harvest operations or fuels treatments. The carbon currently stored in live trees would not be converted to the harvested wood carbon pool. A portion would be converted to the forest carbon "other than live trees" pool through the ongoing processes of tree mortality. The BLM did not estimate the carbon flux due to decay from this pool but it is not expected to change the relative magnitude of difference between the alternatives.

After 70 years of growth, live tree carbon would increase to 109,474 tonnes, an increase of 47,127 tonnes from the current level of 62,620 tonnes.

The No Action Alternative would result in greater net carbon storage over the 70 year analysis period than the Proposed Action by approximately 24,654 tonnes.

Table 25. **Greenhouse Gas Emissions and Carbon Storage, All Alternatives**

Source	*Proposed Action*	*Alternative Action*	*No Action*	*Notes*
	TonnesC	***Tonnes C***	***Tonnes C***	
Live tree storage, 2013[46] (current conditions)	**62620**	**62620**	**62620**	**76-134 year old stand**
Live tree storage, 2083[47]	**81102**	**74923**	**109747**	**70 years stand growth**
Net increase, live trees	**18482**	**12303**	**47127**	Tree growth 2015 to 2085
Harvested wood storage, 2083	**9617**	**9100**	**0**	**66% of harvested wood carbon, 80 years**
Total storage increase	**28099**	**21404**	**47127**	**Storage: live trees and harvested wood**
Emissions, 2013-2083	**5627**	**4909**	**0[47]**	**Logging/fuel treatments harvested wood emissions**
Net Carbon Storage Total	**22473**	**16495**	**47127**	**Storage minus emissions, 2015-2085**

Carbon accounting for a particular project is difficult as climate change is a cumulative, global process and CO2 is well mixed in the atmosphere. For this reason, it is important to correctly identify the system boundary (i.e. Proposed Action), but to also acknowledge potential "leakage"

[46] Approximate: Stand exams conducted between 2008 and 2013 and ORGANON operates in 5 year periods

[47] Assumes emissions from seasonal changes and decay of dead matter is balanced to net flux to storage through growth

effects where actions in one area affect carbon storage in others (*McKinley et al. 2011*). For example, substituting wood products instead of more carbon intensive alternatives (e.g. using wood in construction instead of steal or concrete) is a potential way to reduce carbon emissions. Other potential leakage effects include regional shifts in production to make up for shortfalls due to regulations or other market factors (*McKinley et al. 2011*). These effects are beyond the scope of the Outer Limits / Fawn Two project and would need to be analyzed at regional or national scales.

Table 25 shows that seventy years after harvest:

- There is a range in net carbon storage between the alternatives, in general No Action Alternative results in greatest carbon storage over time.
- The Proposed Action and Alternative Action store 35 to 48 percent less carbon than the No Action Alternative. The difference in carbon storage after 70 years between the Proposed Action and No Action Alternative is approximately 24,654, or less than half the 2012 daily carbon emissions by vehicles (65,479 - data from ODEQ) in Oregon.
- Reasons for the differences include carbon emissions under the Proposed Action and Alternative Action that do not occur under the No Action Alternative and less cumulative carbon is stored under the Proposed Action and Alternative Action.
- The difference in carbon storage between the alternatives is not significant at regional, continental, or global scales.

3.3.8 Recreation, Visual Resources and Rural Interface

Sources: *Outer Limits/Fawn Two Rec/Rural Interface/Visual/Wild and Scenic Rivers/Wilderness Character Resources Specialist Report (Recreation Report), Meredith 2015*

3.3.8.1 Affected Environment

Recreation

The Outer Limits/Fawn Two areas are within a forest setting accessed by gravel roads. Evidence of man-made modifications (roads, timber harvest activities, utilities, buildings, houses) is visible from both private and Federal lands within or in the vicinity of the project areas. The project areas have dispersed recreation with no developed recreation sites. The Little North Fork road, near the northern units, has designated recreation sites (North Fork, Bear Creek, and Salmon Falls County Parks, BLM's Canyon Creek and Elkhorn Valley recreation sites, as well as USFS recreation sites further up the canyon) and a large amount of dispersed recreation along the roadway. Recreation developments near the southern units include ODF's non-motorized Santiam Horse Camp and Monument Peak Trails off the Monument Peak Road (10S-3E-2). This site is the closest to the project areas.

OHV Designation and Use

Off-highway vehicle (OHV) usage of the project areas are restricted to existing roads and designated trails. There are no designated OHV trails are within the project areas. Many roads are gated restricting traffic. Activities that may occur in the project areas include OHV riding, biking, hunting, target shooting, driving for pleasure, and special forest product harvest. There are no designated trails in the project areas.

Rural Interface Areas (RIAs)

The proposed project areas are not within a RIA as defined in the Salem District RMP (*RMP p. 39*). RIAs are BLM lands that intersect a created half-mile buffer around county zoning. The BLM must take into account homes located near proposed projects. The closest RIA is more than a quarter mile away from the Fawn Two area in Township 8 South, Range 4 East, Section 31. The haul route would pass residential houses and pass through RIAs.

In general, the concerns of property owners near timber harvest and hauling activities tend to be associated with noise, traffic, and dust from logging and hauling activities, effect to scenic, water and wildlife values, increased public access that may lead to problems with fire hazard, garbage, dumping, and vandalism. Roads surrounding these proposed units have historically experienced log truck traffic.

Designations

There are no designated Wild and Scenic Rivers within the project areas. Elkhorn Creek Wild and Scenic River boundary is over 1.2 miles to the south of the proposed units in the Fawn Two area. The outstandingly remarkable values of this wild designated river include scenery and other values. The Little North Santiam River is an eligible and suitable recreational Wild and Scenic River along the North Fork County Road with the interim ¼ mile boundary just under ½ mile to the south of the same Township 8 South, Range 4 East, Section 31.

There is no designated wilderness within the project areas. The USFS's Opal Creek Wilderness is approximately 1.4 to 1.7 miles to the east in Township 8 South, Range 4 East, Sections 28 and 29. An evaluation of wilderness characteristics in 2006 found wilderness character within Township 8 South, Range 4 East, Section 29 (approximately 0.8 miles east of the Fawn Two area), which is part of a larger Bull of the Woods/Opal Creek addition identified during scoping for the western Oregon Resource Management Plan revision.

Visual Resources

Visual Resource Management (VRM) classes of the project areas are VRM class 3 and 4 based on current project acreage information and ArcGIS data layers for VRM on the Salem District. On VRM class 3 lands, the level of change to the characteristic landscape can be moderate, while on VRM class 4 lands major modifications to the landscape is allowed (*RMP p. 36*). No unique or sensitive visual resources were identified in the project vicinity. Timber management operations near or adjacent to the project areas are observable from private and Federal lands and major roads. The view from major roads and highways of the surrounding terrain is one of timber management where various age classes of trees are visible.

The VRM objectives, as illustrated in the RMP, do not apply to private, residential lands or commercial timberland. In highly visible areas, grass/legume seeding, intensive debris disposal, and selective leaving of trees or brush are employed on occasion to mitigate management impacts of harvest projects. Tree planting, creek buffers, and spacing of timber cut units can mitigate management impacts of regeneration projects.

3.3.8.2 Environmental Effects

Proposed Action

Recreation

Dispersed recreation use within the Outer Limits/Fawn Two units would be restricted approximately three to five years during timber management activities and return to prior usage upon completion of harvest. Other BLM lands nearby would remain available for recreational opportunities. Recreational users in the vicinity would hear the noises of the timber sale operations and may experience traffic delays of minutes to hours. The Santiam Horse Camp and Monument Peak Trail System is familiar with timber management in the vicinity. In 2014, trail users were detoured off roads with high timber hauling to mitigate potential conflicts between timber management and recreational use. It is anticipated that impacts to recreation users to these non-BLM recreation sites would be less than what occurred during 2014 with ODF's timber management adjacent to the trail system due to the distance of the Proposed Action from these sites.

Tree removal from the Outer Limits/Fawn Two units would leave the undergrowth vegetation crushed. Most undergrowth vegetation would return within five years. Harvest activities would obliterate any unauthorized trails. No reconstruction of any unauthorized trails would be allowed, although none are currently known to exist within any of the proposed harvest units. OHV use would be expected to increase if roads and skid trails remain open and are not blocked after harvest operations. Passing vehicles and OHVs could create a fire ignition source for stumps and logging debris from vehicle sparks (from lack of proper spark arrestor or catalytic converter in the muffler system), heating grasses (fine fuels) from idle vehicles, or tossing out burning materials such as cigarettes.

Rural Interface Areas (RIAs)

RIAs are not present within the project areas. Residences along the haul route and in close proximity to timber harvest activities may hear equipment harvesting trees, noise from log truck traffic, experience dust from gravel road traffic, and experience delays for safety. Disturbance from this proposed timber harvest would be short-term lasting a few weeks to months. The Proposed Action would have no effect on RIAs other than increased log truck traffic.

Visual Resources

The Proposed Action would comply with VRM class 3 and 4 objectives. The project units are in the foreground-middle ground (up to 5 miles away), background (5 to 15 miles from view, and seldom seen (hidden from view). Portions of units closest to major highways and travel routes (Highway 22 and Little North Fork Road) are visible in the distance when looking from major public travel routes, and may not be observable since the rolling mountains, remaining trees, and vegetation block the view (*see Figures 1-6, EA Section 1.2*) Those units fall within Township 8 South, Range 3 East, Section 25 and Township 10 South, Range 4 East, Section 17. For the most part BLM lands are unidentifiable from other lands when looking at the landscape from any vantage point. Traffic speeds reduce the time any unit is visible.

Visual disturbance of the project areas would be associated with modifications to vegetation and other ground disturbing activities from timber sale operations. Evidence of harvest activities would not be observable within five years as understory vegetation returns to a more natural

appearance and the remaining stand continues to mature. A forest setting and most of the canopy would remain in thinning units. Harvest activities would remove a portion of trees from the proposed units leaving undergrowth vegetation crushed. Logging debris and crushed undergrowth vegetation would continue turning brown to red as it dies, leaving the view of the units undesirable. Fuel treatment of logging debris, if burned, would result in short-term decline in visual quality from smoke and the units left blackened. Fuel treatments would comply with state smoke management regulations, thus reducing the affect to visual quality to a few days (*see EA Section 3.3.6*). Understory vegetation and the remaining trees would rebound, grow, and continue to green up, covering logging debris and burn pile scars. The PDFs, time in view and unit locations mitigate any adverse effect to scenic resources according to VRM class 3 and 4 objectives.

Regeneration harvest units would comply with VRM class 3 and 4 objectives. These actions would not draw attention to the casual observer since 12-15 trees per acre in the Outer Limits unit and 16 to 22 trees per acre in Fawn Two would remain in the regeneration harvest units; thinned patches would break up the landscape within other units and have irregular boundaries and shapes. The forested setting would be changed to open areas with clumps of trees and individual trees scattered throughout the units. The area would be blackened immediately after burning with some dead trees serving as snags. Growing vegetation, including planted seedlings, would grow and hide most of the blackened ground and debris within approximately three years and would grow into a forested appearance again over the next three decades.

Alternative Action

The Alternative Action of commercial thinning would comply with VRM class 3 and 4 Management Objectives. These actions would not draw attention to the casual observer due to the increase in leave trees. All other effects associated with recreation, OHV use and RIAs would remain the same as the Proposed Action.

Cumulative Effects

Timber harvest would interrupt recreation activities for approximately three to five years and is expected to return to prior usage. Additional road closures may occur upon completion of harvest activities. The Outer Limits/Fawn Two area would have minimal to no impact on recreational uses due to the fact there are other opportunities available. Residential development along haul routes routinely receives log truck traffic from timber management activities on private and Federal lands.

Looking at aerial photos it is evident that timber management has occurred for many years and will continue to occur in the viewshed, both thinning and regeneration harvest activities. Timber management activities are likely to continue on both private and Federal lands in the vicinity. Timber management activities would continue to result in temporary changes to visual resources while logging debris and crushed undergrowth vegetation dies, turning brown to red. If logging debris piles are burned, blackened areas would be visible until vegetation growth covers the scars and smoke would dissipate. Vegetation would green up and return within five years leaving the units less noticeable from roads and residences.

No Action Alternative

With the exception of unexpected changes (i.e. wildfire or disease), the project areas would continue to provide a forest setting for dispersed recreation opportunities and local residents. A three to five year increase in log truck traffic, noise and other disturbances related to the harvest of the project units would not occur. Timber management activities and log truck traffic would continue on both private and Federal lands in the vicinity. No modifications to the landscape character of the project areas would be expected to occur. Modifications to the landscape character in the area around the projects would still be expected as a result of activities on other lands.

3.3.9 Cultural Resources

Sources incorporated by reference: Greatorex, F. Fawn Two Culture Resource Report, 2015, Outer Limits Cultural Report, 2015.

3.3.9.1 Affected Environment

The Outer Limits area

No cultural sites were located during the survey of the Outer Limits area. However, several isolated historical artifacts were located adjacent to BLM Road 10S-4E.28.2. These consisted of metal objects, that were photographed and locations recorded. One artifact, possibly a large metal wheel, or section of, is imbedded in BLM Road 10S-4E.28.2, and will be left in place. If the object needs to be removed, culture resource staff will be contacted so they may photograph and record the object.

The survey was limited to the areas of proposed ground disturbance high probability areas (20 percent and less slope, hill tops, ridges and benches). The survey was accomplished by clearing away vegetative matter in one meter square area down to mineral soil in a 30m x 30m grid pattern. These areas and exposed soil (root wads, game trails, and road cuts) were observed for artifacts and other indications of cultural properties. Because of the dense vegetation and accumulation of decomposing vegetative matter and historical logging practices, it is possible that any cultural properties were destroyed or obscured by these factors.

The Fawn Two area

No cultural properties were located during the survey which was limited to the areas of proposed timber sale units plus a buffer zone of 30 m (approximately 33 yards), in high probability areas. Survey was accomplished by clearing away duff in a 1m x 1m (approximately 1 yard) area to observe mineral soil in an approximate 25m x 25m (27 yards) grid pattern and observing bare earth when encountered. Each area cleared was observed for artifacts or indications of cultural properties.

The nearest cultural property on BLM lands is the Rabbit Ears Rock Shelter, which, due to site's prominent place on the land scape, can be seen from the general area, and observation of this feature could possibly raise interest. The site has been monitored previously with no evidence of people visiting the site and the probability of people visiting the site is low.

3.3.9.2 Environmental Effects

Proposed and Alternative Actions

On the basis of this investigation, it is considered unlikely that any cultural resources eligible for nomination to the National Register of Historic places would be affected by this project. Since the closest known site to the Fawn Two area is outside of the proposed unit boundaries, no additional protection is needed.

Ground and cable timber harvest would only be likely to impact above-ground, historical properties such as cabins, logging sleds, or other sites associated with historic logging activities, none of which were located during survey. Road rehabilitation and restoration would have minimal impact. New road construction may expose prehistoric sites, in which case, culture resource staff would be notified (*see EA Table 7*). Cultural resources found in the future would be evaluated and protected as needed.

Cumulative Effects

No direct effects to cultural resources would be expected, therefore no cumulative effects would be expected.

No Action Alternative

The current status and trends in the project areas for cultural resources would continue.

3.3.10 Review of Elements of the Environment Based on Authorities and management Direction

Table 26. **Elements of the Environment Review based on Authorities and Management Direction**

Element of the Environment /Authority	Remarks/Effects
Aquatic Conservation Strategy	In compliance with PCFFA IV (Civ. No. 04-1299RSM), this project complies with the Aquatic Conservation Strategy described in the NWFP and RMP. This project also complies with the PCFFA II (265 F.3d 1028 (9th Cir. 2001)) by analyzing the site scale effects on the Aquatic Conservation Strategy. EA Section 3.3.11 shows how the Outer Limits/Fawn Two project meets the Aquatic Conservation Strategy in the context of the PCFFA cases. EA Chapter 3 analyzes specific effects of the Proposed Action and Alternative Action.
Air Quality (Clean Air Act as amended (42 USC 7401 et seq.)	This project is in compliance with this direction because air quality impacts would be of short duration (one burn period during implementation of prescribed fire). Addressed in Text (*see EA Section 3.9*).

Element of the Environment /Authority	Remarks/Effects
Cultural Resources (National Historic Preservation Act, as amended (16 USC 470) [40 CFR 1508.27(b)(3)], [40 CFR 1508.27(b)(8)]	This project is in compliance with this direction and the project would have no effect on this element because cultural resource inventories of the affected area have been conducted and management actions will avoid damage to cultural resources.
Ecologically critical areas [40 CFR 1508.27(b)(3)]	The project would have no effect on this element because there are no ecologically critical areas present within the project areas. Addressed throughout the EA, see table of contents.
Energy Policy (Executive Order 13212)	This project is in compliance with this direction because this project would not interfere with the Energy Policy (Executive Order 13212).
Environmental Justice (E.O. 12898, "Environmental Justice" February 11, 1994)	This project is in compliance with this direction because the project would have no effect on low income populations.
Fish Habitat, Essential (Magnuson-Stevens Act Provision: Essential Fish Habitat (EFH): Final Rule (50 CFR Part 600; 67 FR 2376, January 17, 2002)	No fish species with Bureau Status are found within the project area. Timber harvest and connected actions in the project area effects on Essential Fish Habitat (EFH) as designated under Magnuson-Stevens Fishery Management Act are discussed in the text.
Farm Lands, Prime [40 CFR 1508.27(b)(3)]	The project would have no effect on this element because no prime farm lands are present on BLM land within the Cascades RA.
Floodplains (E.O. 11988, as amended, Floodplain Management, 5/24/77)	This project is in compliance with this direction because the proposed treatments would not change or affect floodplain functions.
Hazardous or Solid Wastes (Resource Conservation and Recovery Act of 1976 (43 USC 6901 et seq.) Comprehensive Environmental Repose Compensation, and Liability Act of 1980, as amended (43 USC 9615)	This project would have no effect on this element because no Hazardous or Solid Waste would be stored or disposed of on BLM lands as a result of this project.
Healthy Forests Restoration Act (Healthy Forests Restoration Act of 2003 (P.L. 108-148)	This project is in compliance with this direction because treatments would decrease the risk of stand replacement fire and help restore forests to healthy functioning condition (*see EA Section 3.4, 3.9*)
Migratory Birds (Migratory Bird Act of 1918, as amended (16 USC 703 et seq)	This project is in compliance with this direction because regeneration harvest treatments are restricted during times of nesting for migratory birds; proposed treatments would provide a variety of habitat for migratory birds. Addressed in text (*see EA Section 3.3.1, 3.3.5*).

Element of the Environment /Authority	Remarks/Effects
Native American Religious Concerns (American Indian Religious Freedom Act of 1978 (42 USC 1996)	This project is in compliance with this direction because no Native American religious concerns were identified during the scoping period (*see EA section 1.8*).
Noxious weed or non-Invasive, Species (Federal Noxious Weed Control Act and Executive Order 13112)	This project is in compliance with this direction because PDFs would prevent establishment of new populations of invasive plant species and because vegetation development would result in decline in both number and vigor of invasive plant populations in the project area. Addressed in text (*see EA Sections 2.3, 3.3.1*)
Park lands [40 CFR 1508.27(b)(3)]	The project would have no effect on this element because there are no parks within or adjacent to the project area.
Public Health and Safety [40 CFR 1508.27(b)(2)]	The project would have no effect on this element because the public would be restricted from the active parts of the project area during operations, and the projects would not create hazards lasting beyond project operations. (*see EA section 2.3, 3.3.7*)
Threatened or Endangered Species (Endangered Species Act of 1983, as amended (16 USC 1531)	This project is in compliance with this direction because the actions comply with direction in the RMP/FEIS with regard to Threatened or Endangered Species (*see EA Section 3.3.1, 3.3.5, 5.1*).
Water Quality –Drinking, Ground (Safe Drinking Water Act, as amended (43 USC 300f et seq.) Clean Water Act of 1977 (33 USC 1251 et seq.)	This project is in compliance with this direction because Oregon State water quality standards would be adhered to and the area hydrology would not be changed measurably. Addressed in text (*see EA Sections 3.3.2*)
Wetlands (E.O. 11990 Protection of Wetlands 5/24/77) [40 CFR 1508.27(b)(3)]	This project is in compliance with this direction because no wetlands are within the harvest areas and any adjacent wetlands found would be protected by buffers. (*see EA Sections 1.4.1, 2.3, 3.3.1, 3.3.5*)
Wild and Scenic Rivers (Wild and Scenic Rivers Act, as amended (16 USC 1271) [40 CFR 1508.27(b)(3)]	This project is in compliance with this direction because there are no Wild and Scenic Rivers within or adjacent to the project area. (*see EA section 3.3.7.1*)
Wilderness (Federal Land Policy and Management Act of 1976 (43 USC 1701 et seq.); Wilderness Act of 1964 (16 USC 1131 et seq.)	This project is in compliance with this direction because there are no Wilderness Areas or areas being considered for Wilderness Area status in the project area. (*see EA section 3.3.7.1*)

3.3.11 Compliance with Aquatic Conservation Strategy (ACS)

The Four Components of ACS

Based on the environmental analysis described in the previous sections of the EA, Cascades RA Staff has determined that the project complies with the ACS on the project (site) scale. The project complies with the four components of the ACS, as follows:

ACS Component 1 - Riparian Reserves

The project would comply with Component 1 by maintaining canopy cover along all streams and wetlands, which protect stream bank stability and water temperature. SPZs would protect streams from direct disturbance from logging. Road and landing locations have been minimized in Riparian Reserves. Addressed in text (*see EA sections 3.2.2, 3.2.3*).

ACS Component 2 - Key Watershed

The Little North Santiam 5th field watershed is a Tier 1 Key Watershed (*RMP p. 6, ROD p. B-18*). The project would comply with Component 2 because the project would not result in a net increase in road mileage (*see EA Section 2.3.1*). The Middle North Santiam 5th field watershed is not a Key Watershed, therefore any timber harvest in this watershed also complies with this ACS component (see *EA Sections 2.3.1, 3.2*).

ACS Component 3 – Watershed Analysis

The project would comply with Component 3 by incorporating the following recommendations from the Little North Santiam Watershed Analysis (LNSWA) and the North Santiam River Watershed Analysis (NSRWA):

- Density management and thinning in Riparian Reserve to develop older forest stand characteristics. Thinning in this project is designed to develop the large tree component faster, leading to earlier potential for recruiting CWD, snag, and large tree habitat and to develop understory vegetation and maintains 50 percent average crown closure. Untreated areas provide additional range of species and density mix.
- In the LNSWA, Recommendation #5 addresses thinning younger stands in Riparian Reserve: "Implement density management prescriptions in Riparian Reserve, LSR to develop and maintain older forest stand characteristics in younger age classes. Desirable stand characteristics include larger trees for a large green tree component and recruitment of large standing dead/down CWD in future stands, multi-layered stands with well-developed understories, and multiple species that include hardwoods and other minor species" (*LNSWA Chapter 7, page 5*).
- In the NSRWA, Recommendation #1 addresses thinning in Riparian Reserves: "..Implement density management prescriptions to develop and maintain late successional forest stand characteristics. Desirable stand characteristics include larger trees for a large green tree component and recruitment of large standing dead/down woody debris in future stands, mulit-layered stands and well developed understories, and multiple species that include hardwoods and other minor species." (*NSRWA Section 3, page 6*).

ACS Component 4 – Watershed Restoration

The project would comply with Component 4 by the combination of thinning and unthinned areas in Riparian Reserves, which would further enhance terrestrial habitat complexity in the long and short term. Thinning in all LUAs would be expected to result in long-term restoration of large conifers and the potential for material that would contribute to in-stream habitat complexity in the long-term.

The Nine Objectives of the ACS

The Cascades RA Staff has reviewed this project against the ACS objectives at the project or site scale with the following results. The No Action Alternative does not retard or prevent the attainment of any of the nine ACS objectives because this alternative would maintain current conditions. The Proposed or Alternative Actions do not retard or prevent the attainment of any of the nine ACS objectives for the following reasons.

The Riparian Reserve treatments for the Proposed Action and the Alternative Action are identical, so the following analysis of the Proposed Action applies also to the Alternative Action unless specifically stated otherwise.

ACSO 1: Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted. Addressed in Text (*EA sections 3.3.1., 3.3.5*). In summary:

No Action Alternative: The No Action Alternative would maintain the development of the existing vegetation and associated stand structure at its present rate. The current distribution, diversity and complexity of watershed and landscape-scale features would be maintained. Faster restoration of distribution, diversity, and complexity of watershed and landscape features would not occur.

Proposed Action: The proposed combination of thinning from below and unthinned areas in the Riparian Reserve LUA would result in forest stands that exhibit attributes typically associated with stands of a more advanced age and stand structural development (larger trees, a more developed understory, and an increase in the number, size and quality of snags and down logs) sooner than would result from the No Action Alternative.

This mix of treated and untreated stands would immediately contribute to restoring watershed and landscape scale diversity and complex features by introducing some changes in the current uniformity. Several elements of complexity, such as large tree crowns, would continue developing faster than untreated areas for decades. Other elements of complexity, such as understory development, may or may not trend toward similarity after several decades. Treated stands, especially with follow-up treatment over the next few decades, would tend to develop fewer but larger snags and CWD during the next few decades and may tend toward similar characteristics as stands approach two centuries old.

The SPZ would provide undisturbed corridors for travel and provide resources for aquatic and riparian depended plan and animal species.

Since Riparian Reserve provides travel corridors and resources for aquatic, riparian dependent and other late-successional associated plants and animals, the increased structural and plant diversity would ensure protection of aquatic systems by maintaining and restoring the distribution, diversity and complexity of watershed and landscape features.

2. ACSO 2: Maintain and restore spatial and temporal connectivity within and between watersheds. Addressed in Text (*EA sections 3.3.1., 3.3.2., 3.3.3., 3.3.5*) In summary:

No Action Alternative: The No Action Alternative would have little effect on connectivity within the affected watershed except in the long term (several decades).

Proposed Action: Long term connectivity of terrestrial watershed features would be improved by enhancing conditions for stand structure development. In time, the Riparian Reserve LUA would improve in functioning as refugia for late successional, aquatic and riparian associated and dependent species. Both terrestrial and aquatic connectivity would be maintained, and over the long-term, as the Riparian Reserve LUA develops late successional characteristics, lateral, longitudinal and drainage connectivity would be restored.

3. ACSO 3: Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations. Addressed in Text (*EA sections 3.3.2, and 3.3.3*). In summary:

No Action Alternative: The current condition of physical integrity would be maintained because there would be no management actions to change any of these features.

Proposed Action: The current condition of physical integrity would be maintained because there would be no timber harvest operations within SPZ which could change these features. Physical integrity of channels at existing stream crossings would be altered for one to several years following the installation of 12 culverts. In the long term, replacement of these culverts would prevent impacts to the physical integrity of these streams by eliminating almost all the potential for failure. Within the road prism (estimated at 30 feet maximum width), the channel surface, banks, bed and vegetation would be compacted (bulk density of soils increased by as much as 30 percent), vegetation would be disturbed or removed from the banks within the road prism, and the bed/banks would be reshaped and stabilized with woody debris and vegetation after use. Due to the stable nature of the channels, the low gradient, vegetation both up and downstream from the sites and the stream crossings currently have culverts installed, little to no additional disturbance to channel morphology would be expected either upstream or downstream from the crossings. In addition, installing 8 cross drain culverts would reduce road-related inputs to streams.

4. ACSO 4: Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Addressed in Text (*EA sections 3.3.2, and 3.3.3*). In summary:

No Action Alternative: It is assumed that the current condition of the water quality would be maintained, unless an existing culvert fails, because no management actions would change things that currently contribute to water quality.

Proposed Action: Water quality would be maintained by retaining SPZ in the Riparian Reserve LUA to prevent measurable changes to sediment input from the slopes above the streams and prevent measurable effects on stream temperatures, pH or dissolved oxygen. Proposed new roads and road renovation would be done in places where there would be no increased

hydrologic connection or sediment input into streams or riparian areas, except as described in the following paragraph.

Sediment transport and turbidity in the watershed is likely to increase in the short term as a direct result of replacing 12 culverts. Sediment increases would not be visible beyond 0.5 miles downstream from the culvert replacement sites, would be of low magnitude and short duration (hours to days), and would not be expected to affect fish, aquatic species or human uses. Over the long term (generally beyond the first season after culvert replacement, fully beyond 3-5 years), the risk of high level sediment inputs from catastrophic failure of the culverts would be reduced and current conditions/trends in turbidity and sediment yield would likely be maintained.

Log hauling would not be expected to visibly increase turbidity for more than a few hours, if at all, because PDFs to prevent sediment transport and to restrict use of unsuitable haul routes to prevent generation sediment would be implemented. Additional PDFs to immediately detect and correct any sediment transport that might occur would also be implemented. Any stuck sediment increases would be of low magnitude and short duration (hours) and would not be expected to affect fish, aquatic species or human uses.

5. ACSO 5: Maintain and restore the sediment regime under which aquatic ecosystems evolved. Addressed in Text (*EA sections 3.3.3, 3.3.3, and 3.3.4*). In summary:

No Action Alternative: It is assumed that the current sediment regime would be maintained.

Proposed Action: SPZs in Riparian Reserves would be a minimum of 70 feet wide on perennial streams and 30 feet on intermittent streams in thinning areas. In areas proposed for regeneration harvest under the proposed action, all streams have a minimum one site tree distance of no harvest (140 feet in Outer Limits unit, and 240 feet in Fawn Two area). These no-harvest buffers persist in the thinning alternative for these units (*see EA Figures 1-6, Section 1.2*).

Hauling restrictions and best management practices would maintain the sediment delivery within its natural range.

6. ACSO 6: Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. Addressed in Text (*EA sections 3.3.2, and 3.3.3*). In summary:

No Action Alternative: In-stream flows and related habitats, patterns would be maintained because there would be no management actions or predictable natural events that would change inputs to stream flows or sediment, nutrient and wood inputs.

Proposed Action: In-stream flows would be maintained because the Proposed Action would retain more than half of the forest canopy in treated Riparian Reserve areas and treated areas would comprise less than eight percent of Riparian Reserve in the project vicinity, and less than one percent of the acres in the combined 6th field watersheds affected. Also, only a small fraction of forest cover would be removed for new roads and landings and the stream network would not be increased by road construction. A preliminary analysis for the risk of increased peak flow as a result of forest harvest, using the Oregon Watershed Assessment Manual watershed analysis methods for forest hydrology (*OWEB 1997*), indicates that the Proposed Action would be unlikely to produce any measurable effect on stream flows.

Riparian, aquatic and wetland habitats and patterns of sediment, nutrient and wood routing would be maintained because the Proposed Action would maintain riparian microclimate conditions by maintaining intact SPZs that retain the primary shade zone and retain substantial portions of the canopy in the secondary shade zone. The SPZs would retain patterns of sediment and nutrient inputs and retain more than 90 percent of the trees that would potentially contribute to wood routing.

In-stream flows would be maintained because the Proposed Action would maintain canopy cover greater than 30 percent in the Fawn Two area, is above the snow zone in the Outer Limits area, would not build permanent roads, and would improve failing culverts. Therefore, the Proposed Actions is unlikely to produce any measurable effect on stream flows.

7. ACSO 7: Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands. Addressed in Text (*EA sections 3.3.2*). In summary:

No Action Alternative: The current condition of flood plains and their ability to sustain inundation as well as the water table elevations in meadows and wetlands is expected to be maintained.

Proposed Action: With the exception of road renovation at stream crossings, all operations, equipment and disturbances would be kept a minimum of 70 feet from all wetlands and perennial stream channels, and 30 feet from all intermittent stream channels. The Proposed Action would maintain the current condition of floodplain inundation and water tables.

8. ACSO 8: Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability. Addressed in Text (*EA sections 3.3.1; 3.3.2; and 3.3.3*). In summary:

No Action Alternative: The current species composition and structural diversity of plant communities would continue along the current trajectory. Diversification would occur over a longer period of time.

Proposed Action: Biological and physical riparian areas would be contained entirely within the SPZs. The SPZs and other untreated areas would maintain the current species composition and structural diversity of plant communities in riparian areas and wetlands from a minimum of 30 feet (intermittent streams) to a minimum of 70 feet (perennial streams) in treatment areas.

The Proposed Action would restore structural diversity in the upland portions of the Riparian Reserve by accelerating growth and development of some elements of structural diversity that are normally associated with late successional forests, such as shrub component, understory development, large diameter trees, and deep crowns with large limbs. It would accelerate development of large diameter snags and down wood by accelerating tree growth to provide potential source material for this dead wood.

9. ACSO 9: Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species. Addressed in Text (*EA sections 3.3.1; 3.3.2; 3.3.3 and 3.3.5*). In summary:

No Action Alternative: Habitats would be maintained over the short-term and continue to develop over the long-term with no known impacts on species currently present.

Proposed Action: The Proposed Action would restore the upland portions of these habitats in the long term by diversifying habitat characteristics across the landscape and accelerating development of some late successional characteristics to provide habitat for a wider variety of plant and animal species across the landscape at the 6th field watershed level. The Proposed Action would have no adverse effect on riparian dependent species. Although thinning activities may affect some invertebrates within the treatment areas, adjacent non-thinned areas should provide adequate refugia for the species. In the long term, the treatments would restore elements of structural diversity to treatment areas in the Riparian Reserve LUA. These attributes would help to provide resources currently lacking or of low quality, and over the long-term, would benefit both aquatic and terrestrial species.

Chapter 4: List of Preparers

Table 27. **List of Preparers**

Table 27. **List of Preparers**

Resource	Name	Reviewed By (Initials)	Date
Writer/Editor	Alisa Tanner	AT	3/14/16
NEPA Review	Whitney Wirthlin	WJW	3/14/16
Botany	Terry Fennell		3/14/16
Cultural Resources	Fred Greatorex		3/21/16
Engineering	Steve Ditterick (Fawn Two) Amy Stammers (Outer Limits)	SLD AMS	3-14-16 3/14/16
Fire/Fuels	Christopher Waverick		3/17/16
Fisheries	Bruce Zoellick		3-14-16
Hydrology/ Water Quality	Patrick Hawe	WPH	03/18/16
Logging Systems	Jay Bernards		3/14/16
Recreation, Visual Resources and Rural Interface	Traci Meredith		3/15/16
Silviculture	Dugan Bonney, Kenneth Ruzicka	KR	3-15-2016
Soils	Patrick Hawe	WPH	3/18/2016
Wildlife	Corbin Murphy		03/15/2016

Chapter 5: Contacts and Consultation

5.1 Consultation

5.1.1 U.S. Fish and Wildlife Service (USFWS)

The Outer Limits/Fawn Two project proposal was submitted for formal consultation with USFWS as provided in Section 7 of the Endangered Species Act (ESA) of 1973 (*16U.S.C. 1536 (a)(2) and (a)(4) as amended*) during the FY2015 consultation process.

Cumulative effects to spotted owls and their habitat were analyzed thoroughly at multiple scales during the 2015 consultation process, including the current Environmental Baseline (*Biological Assessment (BA) pp.16-23; Biological Opinion (BO) pp. 34-45*), and Cumulative Habitat Effects Summary (*BA p. 122; BO p. 131-132*). Unit Specific Data, including the environmental baseline and effects of proposed projects that are likely to adversely affect spotted owls, are summarized by Administrative Units in the Willamette Province (*BA pp. 131-197; BO pp. 145-221*), including the Cascades RA where the Outer Limits/Fawn Two areas are located (*BA pp. 157-170; BO pp. 175-191*).

The BO issued by the USFWS concurred with the analysis in the BA that the combined effects to spotted owl habitat and populations of all of the actions proposed in the Willamette Province (including the Outer Limits/Fawn Two Project) are not likely to jeopardize the continued existence of the spotted owl and are not likely to adversely modify spotted owl critical habitat, and would not likely diminish the effectiveness of the conservation program established under the NWFP to protect the spotted owl and its habitat (*BO p. 132*).

In the Outer Limits area: The Outer Limits regeneration harvest may affect, and is not likely to adversely affect the spotted owl due to the removal of 16 acres of dispersal habitat. Dispersal habitat would be converted to young early-seral stage capable habitat (*see EA Table 4 definitions*). Suitable spotted owl habitat conditions in the regeneration harvest units would not be achieved again for 80 years.

The Outer Limits regeneration harvest is within the PHR radius of Monument Peak known spotted owl sites. The current average diameter of the stand is 10.9 inches. The Willamette Physiographic Region Biological Assessment for Habitat Modification (NLAA) FY2014 defined dispersal habitat as stands that have conifer trees over 11 inches average diameter. It is unlikely that this stand is used for dispersal or foraging for the spotted owls at this site, based on the size of trees and habitat quality.

The Outer Limits Project is in compliance with the new Final Recovery Plan for the Northern Spotted Owl (*USFWS 2011*). The habitat is not located in LSR or critical habitat, and does not meet the criteria for Recovery Action 10 or Recovery Action 32. No Incidental Take of spotted owls is expected to occur as a result of regeneration harvest.

In the Fawn Two area: The Fawn Two regeneration harvest may affect, and is likely to adversely affect, the spotted owl due to the removal of 64 acres of suitable habitat. Suitable habitat would be converted to young early-seral stage capable habitat (*see EA Table 4 definitions*). Suitable spotted owl habitat conditions in the regeneration harvest units would not be achieved again for 70 to 80 years.

The Fawn Two regeneration harvest is not within the PHR radius of any known spotted owl sites. The Fawn Two Project is in compliance with the new Final Recovery Plan for the Northern Spotted Owl (*USFWS 2011*). The habitat is not located in LSR or critical habitat, and does not meet the criteria for Recovery Action 10 or Recovery Action 32. No Incidental Take of spotted owls is expected to occur as a result of regeneration harvest. Current surveys show no spotted owl presence in the Fawn Two area. There are no actual spotted owls that would be "harmed" by the action and thus the BO (*pp.133-134*) did not issue any "take" of spotted owls associated with this project.

The proposed thinning, regeneration harvest, and connected actions described in this EA have incorporated the applicable General Standards that were described in the BA (*pp. 9-10*) and BO (*BO, pp. 22-24*); and comply with all reasonable and prudent measures outlined in the BO (*BO, pp. 134-135).* This includes delaying proposed activities to avoid disrupting spotted owls at known spotted owl sites until after the critical nesting season, and monitoring/reporting on the implementation of this project to the USFWS.

5.1.2 National Marine Fisheries Service (NMFS)

Consultation with the NMFS on effects of the Outer Limits/Fawn Two project on Upper Willamette River (UWR) Chinook salmon and UWR winter steelhead trout is not required because the project would have no effect on these species or on essential fish habitat. Most harvest units are located on 1st and 2nd order headwater tributaries greater than one mile from listed fish habitat (LFH) in Rock Creek, Madd Creek and the Little North Santiam River. Perennial streams would have minimum no-entry SPZs of 70 feet. In the Fawn Two area where units are within 1 mile of LFH, SPZs of up to 480 feet would be implemented and ensure to temperature changes to LFH downstream (*Groom et al. 2011; U.S. Forest Service and Bureau of Land Management TMDL Implementation Strategy 2005*).

The regeneration harvest alternative would have no peak flow effect on LFH due to maintaining enough area with canopy closures greater than 30 percent in the Little North Santiam 5th field watershed and harvest units remaining above the snow zone in the Middle North Santiam 5th field watershed (*see hydrology report discussion of peak flow effects*).

Hauling in the Fawn Creek area: Steelhead and salmon habitat would not be impacted by log hauling. The haul route is gravel surfaced, with one stream crossing 0.8 miles upstream of salmon and steel head habitat in the Little North Santiam River. Other stream crossings are over a mile upstream of LFH. The maximum distance sediment and turbidity is likely to move from road crossings is 0.5 miles downstream (*Foltz and Yansek 2005*). The Fawn Creek road is well maintained with short ditchlines, and ditches are vegetated (thus limiting the capacity of the ditches to transport sediment; *Luce and Black 1999*), with no evidence of sediment moving to channels at the stream crossings.

Hauling in the Outer Limits area: Steelhead and salmon habitat would not be impacted by log hauling along the North Rock Creek road in the Outer Limits area. The North Rock Creek road crosses several 1st and 2nd order tributaries to Rock Creek at 0.6 to 0.7 mile upstream of LFH. The road is well graveled (ca. 12 inch deep gravel bed) with short ditchlines, and ditch run outs are well vegetated (thus limiting the capacity of the ditches to transport sediment; *Luce and Black 1999*), with no evidence of sediment moving to channels at the crossings. Use of North Rock Creek Road for winter season log haul will have no effect on listed fish habitat (no

sediment will move to listed fish habitat) both because of distance of crossings to LFH and condition of road surface, ditchlines, and ditch turnouts.

LFH would not be impact by log hauling along the Monument Peak road, as most stream crossings are 0.7 miles or greater from steelhead habitat in lower Little Rock Creek, with short ditchlines and no evidence of sediment moving to streams. However, three stream crossings are located on 1st order tributaries to Little Rock Creek within 0.5 mile of listed fish habitat. Two of the three crossings either have evidence of small amounts of sediment reaching the stream crossing or have a long ditchline (450 feet) connected to the stream crossing.

Log haul during the winter would have no effect on steelhead habitat, if ditch and road surface drainage is disconnected from the streams at these two crossings using the following mitigation actions:

For winter haul on the Monument Peak Road (10S-3E-2), install sediment traps/and or filters in the ditches that drain to stream crossings and prevent sediment transport from 1st order tributaries leading into Little Rock Creek. These three crossings are located in the SE ¼ of Section 2 (T.10S, R.3E) (*see EA Section 3.3.3.2*). These methods should include but are not limited to:

- Install straw bales or wattles the ditch line on the west side of the road at the downstream-most crossing.
- Install a line of straw bales or erosion fencing on the inside curve at the middle crossing to carry runoff and sediment into a vegetated area downslope of the stream crossing; and install a series of straw bale sediment traps in the west ditch at the middle crossing to prevent sediment delivery from the ditch (450 ft. long) to the stream crossing
- Install a continuous line of straw bales or erosion fencing on the inside curve (east side) of the upstream-most crossing to carry runoff and sediment past the stream and turn it out into a vegetated area downslope of the crossing.

5.1.3 Cultural Resources: Section 106 Consultation with State Historical Preservation Office

Cultural resource surveys were conducted throughout the sale area during 2015 (*see EA Section 3.3.10*) Cultural resource inventories did not identify any pre-contact archaeological sites within the project area. A summary report of the cultural resource inventory will be sent to the State Historic Preservation Office.

5.2 Scoping

See EA Section 1.8.1 for a description of scoping methods and the issues identified through scoping.

5.3 EA Comment Period

The EA and FONSI will be made available for public review and comment from April 1st to April 30th, 2016. On or before the first day of the public review and comment period, letters announcing the public review and comment period will be mailed to persons and organizations on the Scoping Letter mailing list, and those who submitted Scoping Comments. The letter, the EA and the FONSI will be posted on the Salem District ePlanning project website at http://tinyurl.com/OuterLimitsFawnTwo and the notice for public comment will be published in

a legal notice in the Stayton Mail newspaper. Written comments should be addressed to John Huston, Field Manager, Cascades Field Office, 1717 Fabry Road S., Salem, Oregon 97306. Emailed comments may sent to jhuston@blm.gov.

Chapter 6: List of Interdisciplinary Team Reports Incorporated by Reference

The IDT reports can be found in the Outer Limits/Fawn Two EA project file and are available for review at the Salem District Office.

Outer Limits/Fawn Two Silvicultural Prescription, Bonney 2015.

Outer Limits/Fawn Two Fuels Specialist Report, Mortensen 2015.

Cascades Resource Area EA Wildlife Report for Outer Limits, Cascades Resource Area EA Wildlife Report for Fawn Two, Murphy 2015

Hydrology/Channels/Water Quality: Specialist Report s for the Outer Limits and Fawn Two areas (Hydrology Report); Hawe, 2015

Soils: Specialist Reports for the Outer Limits and Fawn Two Areas (Soils Report; Hawe, 2015,

Outer Limits and Fawn Two Fisheries Specialist Report (Fisheries Report); Zoellick, 2015

Outer Limits/Fawn Two Logging Systems Report; Bernards, 2015

Outer Limits/Fawn Two Rec/Rural Interface/Visual/Wild and Scenic Rivers/Wilderness Character Resources Specialist Report (Recreation Report); Meredith, 2015.

Fawn Two and Outer Limits Cultural Resource Reports; Greatorex, F., 2015

Outer Limits/Fawn Two Carbon Analysis; Ruzicka, K., 2016

Chapter 7: Literature Cited

7.1 Government Documents

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BLM Manual 9015 – Integrated Weed Management
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BLM (2012) Resource Management Plan Evaluation Report – Western Oregon Districts. U.S. Department of the Interior, Bureau of Land Management, Oregon State Office, Portland, OR. 226 pp. Available online at: *http://www.blm.gov/or/plans/files/RMPEvaluation.pdf*
BLM (2011) Salem District Annual Program Summary, Plan Maintenance and Monitoring Report, Fiscal Year 2012 http://www.blm.gov/or/districts/salem/plans/files/aps2012.pdf
Healthy Forests Restoration Act of 2003, H.R. 1904
NOAA. 2005. Endangered and threatened species; designation of critical habitat for 12 evolutionarily significant units of west coast salmon and steelhead in Washington, Oregon, and Idaho; Final Rule. Federal Register 70(170):52630-52858.

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